SCIENTIFIC AMERICAN

Motor-Driven Unicycle Stabilized by a Gyroscope
The New York State Barge Canal

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

The National Security Commission

IF there is something radically wrong with our national defense as represented by our naval and military forces, Congress should know it and pass the necessary legislation to set matters right.

Surely this is a self-evident proposition. Self-evident, also, is the proposition that, if we are to have an army and navy, they should be adequate to their duties. We take it that, in the event of foreign aggression, the temper of the people of this country is such that they would play the part of an heroically resisting Belgium rather than that of a tamely submissive Luxemberg.

Although we are the wealthiest nation in the world, with a population of approximately 100,000,000, we are a people pre-eminently peaceful; indeed, we are recognized to-day as the leading national exponent of the principle of universal arbitration. And yet, if what we conceive to be our proper and lawful national policies were assailed by a country which believed that war was the only possible arbiter of international differences, who among us doubts that this country would resist with all the moral and material resources at its command.

Admitting, then, that this country must possess an army and a navy, and that if these military forces are to be of any value whatsoever, they must be fully adequate to their duties, the question presents itself, Are the naval and military forces in this country in sufficient strength, numbers, and preparedness to meet any possible emergency which may arise?

It is with a view to having this question investigated that Representative Gardner has introduced a joint resolution providing for a National Security Commission, the object of which is to make full investigation, by sub-committee or otherwise, into the question of the preparedness of the United States for war, defensive or offensive.

We have reason to believe that his resolution is entirely free from any political significance; in fact, it goes without saying that a subject of this prime importance, which affects or may affect the very life and death of the nation, should be considered from a purely patriotic point of view, and that every member of Congress, be he Democrat or Republican, should approach the consideration of this matter with a mind absolutely free from political bias, and with a sole desire to do the wisest thing for the good of his country.

To those citizens of the United States and to those members of its Congress who take an intelligent interest in the question of our national defenses, this investigation will be largely a work of supererogation; that is to say, the investigation will merely lay emphasis upon certain most serious defects in our national defense with which they have long been familiar. What proportion of the people of this country and its legislators are well informed as to the situation it is impossible to say, but we believe that the proportion is large. Nevertheless, there are millions of people to whom the truth has not yet been brought home, that the unpreparedness of our army, and to a less extent of our navy, is such that, if war burst upon us overnight as it has done upon the nations of Europe, a disaster of the first magnitude must inevitably follow.

It would take a volume to describe the details of the situation. Only a few salient facts can be given here. As regards our army, we have no more than 85,000 effectives; it is short of artillery; and it is so short of ammunition that the whole of its supply would be fired away in a single day's engagement. We have an elaborate system of coast defenses, but only a fraction of the artillerymen necessary to man them. Back of the regular soldiers we have only 120,000 militiamen, and back of these we have absolutely no reserves. We have no heavy mobile siege guns, such as are doing effective work in the European war, and no military motor tractors to render our artillery thoroughly mobile. We have made merely a beginning in developing that aeroplane equipment which is necessary to render field-gun fire accurate against troops in the field.

Although the *material* and *personnel* of our navy are both excellent, the navy as a whole is poorly balanced. No type of vessel in the present war has done such distinguished service as the fast, well-armed scout with which the opposing fleets are both well provided. The work of such vessels as the "Arethusa" and "Undaunted" on the British side, and the fast German vessels of the "Emden" and "Karlsruhe" type, needs no recapitulation here. We have but three of these useful vessels when we should have at least thirty. The torpedo and the mine have again, in this war, established their deadly efficiency. We are so short of torpedoes that a single naval engagement of magnitude, involving the employment of all of our destroyers and submarines and the free use of the torpedo, would find our torpedo fleet without torpedo ammunition for the rest of the war. Does Congress doubt this? Then we beg to inform it, using practically the words of one of its naval experts connected with the Ordnance Department, that it takes about one year to build a torpedo and that the cost of each is about $5,000; that we shall need to secure within the next ten years from all available sources at least 10,000 torpedoes, and that these would cost in the neighborhood of $50,000,000; that the necessary number could be obtained if the Bureau of Ordnance were authorized to provide for securing the needed supply before the end of the fiscal year 1924, an annual appropriation being made for that purpose of $5,000,000. But Congress has seen fit to pay no heed, or practically no heed, to this statement. We are even shorter in our supply of mines than of torpedoes. The navy is short 18,000 men; and we have no adequate reserve (an adequate reserve should include about 50,000 men) from which to man our reserve ships and auxiliaries in the event of war.

The above are a few of the facts which would be brought out by the National Security Commission. They are sufficient to show the necessity for placing before the nation at large, in the clearest and most emphatic manner possible, the true conditions in our army and navy. The enlargement and improvements demanded are merely such as would be sufficient to put this country in a state of effective defense. Only when this condition of preparedness has been reached will the menace of war be permanently removed from the western hemisphere.

Admiral Mahan

IN the death on December 1st of Rear-Admiral Alfred Thayer Mahan, U.S.N., retired, America loses its most able naval strategist and the world its greatest authority on the subject of sea power. We doubt if any one man has impressed upon naval affairs a formative influence, so deep and widespread as that exerted by the late Admiral in that wonderful series of naval works which bears his name.

Admiral Mahan had recently gone to Washington to take up his work as a research associate in the Department of Historical Research in the Carnegie Institution. He was pursuing a special line of historical inquiry, with the object in view of writing a history of American expansion and its bearing on the subject of sea power. Admiral Mahan had contemplated this task for several years and it was designed to be a monumental work. He had pursued his labors for just about one month, when, after a sudden seizure, he died of heart failure, brought on to some extent, it is believed, by the strain of the European war.

Admiral Mahan was born at West Point, N. Y., September 27th, 1840. He was the son of D. H. Mahan, a well-known professor of engineering at the United States Military Academy. After forty years of service in the navy Mahan, on November 17th, 1896, was retired at his own request, in order that he might be able to devote himself entirely to his writings on naval subjects. Only once, about eighteen months after his retirement, was he called to active duty, when in May, 1898, at the outbreak of the Spanish-American war, he was appointed a member of the Naval War Board or Strategy Board, which was formed for the control of naval operations during that conflict.

The international fame of Mahan was acquired almost overnight as the result of his publication of that famous work, "The Influence of Sea Power Upon History." Before the book was written the Admiral was but little known outside of naval and military circles. In the navy he was recognized as a competent officer and a notable lecturer at the Naval War College. Upon his lectures the works which later made him famous were based; but it is a question whether even at the War College it was realized how great were the analytical qualities and the depth of insight and keen sense of proportion which subsequently, upon the publication of his work, raised him at a bound to the position, universally acknowledged, of the world's greatest authority on the subject of sea power.

"The Influence of Sea Power" was published in Boston and its value was immediately recognized by naval reviewers, first in England and then in Germany. It has been claimed that his book was one of the most powerful influences in bringing about the birth of the modern German navy. It was immediately translated into German and Emperor William saw to it that a copy was placed in the library of every German warship. Two years later he published his "Influence of Sea Power on the French Revolution and Empire," and in 1897 appeared his "Life of Nelson" and also "The Interest of America in Sea Power, Past and Future."

In a tribute to Admiral Mahan issued by the Navy Department, it is stated that in England the leading naval men of the day confessed that it had remained for Admiral Mahan to elucidate the work of the British navy in a way that they themselves had never understood or even dreamed of.

In person the Admiral was unusually tall, 6 feet 2 inches, with clean-cut features and a decidedly attractive personality. He had the reserved manner of the scholar. Although Mahan was an ardent advocate of the possession of powerful military forces and especially of a navy adequate to maintain the command of the sea on our own coasts, he was by no means what is called a militarist; indeed, like all military men of the highest stamp, he was an ardent advocate of peace. Outside of his books, Mahan did a considerable amount of literary work for the magazines, and he was always ready to respond to a request for illuminating articles on the current naval developments of the day. Several of these articles have appeared from time to time in the columns of this journal.

A Problem in War Names

"IT'S an ill wind" . . . The war has, for one thing, stimulated interest in geography, and provided the average stay-at-home citizen with a cosmopolitan outlook that will not do him any harm.

We have on other occasions called attention to the fact that Americans are sadly handicapped in their efforts to follow events abroad by the wretched maps of foreign countries found in nearly all American atlases, and we need not, therefore, dwell upon this subject at present, beyond pointing out that the atlases in question are especially unequal to the task of illuminating the war news from the colonial possessions of England and Germany, where so much desultory fighting has occurred. There is, however, one respect in which American cartographers are hardly more at sea than their colleagues abroad, and that is the spelling of geographic names transliterated from the non-Roman alphabets. For example:

The Japanese and British forces recently captured an important German possession in China. What is its name? Let us consult acknowledged *authorities* of English speech, and we shall find: *Kiao-Chau*, Century Atlas; Royal Atlas. *Kiao-chau*, Bartholomew's atlases. *Kiau-chau*, Statesman's Year-Book, 1913. *Kiaochow*, Encyclopædia Britannica, eleventh edition. *Kiao-Chou*, Geographical Journal, vol. 27, 1906, Index. *Kiao-chou*, Ibid., vol. 31, 1908, Index. *Kiauchou*, Ibid., vol. 36, 1910, Index.

Note that we find three spellings (and further search might reveal others) in recent volumes of the *Journal* of the Royal Geographical Society, although this society some thirty years ago adopted an ostensibly uniform system of orthography for native place-names, which has been accepted by numerous other societies and institutions throughout the English-speaking world; and, what is more surprising, none of these three spellings agree with any found in the leading British atlases. To make matters worse, there are sundry German spellings, which were not inappropriate for general use so long as the region in question was a German dependency, e. g.: *Kiautschou*, Meyers Konversations-Lexicon, sixth edition. *Kiau-Tschou*, Stieler's Atlas.

While this case is fairly typical of the confusion that prevails as to the spelling of place-names in China and certain other countries, there are other cases in which divergent spellings lead to more serious results than are to be apprehended from the one above noted. We refer to names in which the *initial* letters are variable, e. g., Tsangpo—Sanpu; or, again, those in which the discrepancies occur near enough to the beginning of the name to materially affect the location of the latter in an alphabetically arranged list, e. g., Lhasa—Lassa. Such cases are the despair of index-makers; because, while it is possible by the use of numerous cross-references to take account of all the recognized spellings, the indexer is confronted with the difficult problem of deciding which form shall be treated as the principal entry in his index.

Engineering

Concrete Roads.—Concrete road construction has increased from 364,000 square yards laid in 1909 to 19,200,000 square yards, which it is estimated has been laid during the season of 1914. This would be sufficient, were it put down in a single stretch, to form a roadway four yards wide and 2,700 miles long.

Trial Trip of the "Moreno."—The dreadnought "Moreno," built by the Fore River Ship and Engine Building Corporation for Argentina, has passed her speed test and exceeded her contract stipulation, by maintaining an average speed of 22.5 knots without being pushed to her speed limit.

Naming Tunnels After Engineers.—A well-deserved and too seldom accorded honor is to be given to engineers by the Baltimore and Ohio Railroad. The four tunnels on the Magnolia Cut-off between Orleans and Little Cacaton, West Virginia, are to be named after four of the road's chief engineers: James L. Randolph, J. M. Graham, D. D. Carothers and Francis Lee Stewart.

Panama Canal Trade.—An aggregate of 583,949 tons of cargo was carried by 113 vessels through the Panama Canal during the two months from August 15th to October 15th. The heaviest trade has been that between Atlantic and Pacific ports of the United States. It embraced 49 passages and constituted 44 per cent of the traffic through the canal and 50 per cent of the total freight.

New United States Naval Drydock.—The Union Iron Works, San Francisco, is under contract with the Navy Department to build a drydock 1,096 feet long by 110 feet wide with 40 feet depth over the sill, which is to be used by United States naval vessels in the Pacific. The department has guaranteed the builders a sufficient amount of business to bring a return of $50,000 a year for six years.

Mesquite Wood for Paving.—So scarce have mesquite wood blocks become that the city of San Antonio, Texas, has abandoned the plan of paving 250,000 square yards of its streets with this wood. Mesquite is a wood that is almost indestructible, very hard, tough and dense. In the Southwest, for many years, it has been used for the sills of adobe houses; it makes an excellent material for street paving.

The New French Four-and-one-eighth-inch Field Gun.—Reports from the seat of war speak of the effective work done by the new French 4 1/8-inch field gun, manufactured by the Schneider works. The gun is much more powerful than the 75-millimeter gun of the French and it has a range of 8½ miles. This is over a mile farther than that of the German 152-millimeter siege gun. Except for its greater caliber, the new piece is very much like the 75-millimeter gun and retains all the rapidity of fire, handiness and accuracy of that piece.

The Largest Chain Drive.—The largest chain drive in existence, three times greater in size than any previously built, is to be found at the Ox Bow Power Plant, on Snake River, Copperfield, Oregon. The plant consists of a 3,600 kilowatt generator, operated by two water-wheel units, each consisting of two pairs of water-wheels of the 48-inch horizontal type, operating under a 21-foot head. The speed of the water-wheels is 147 revolutions per minute, and each water-wheel unit is connected to the generator by four Morse chains, each 21 inches wide, the sprockets on the line shafting having a 2-inch pitch, and the shaft centers being 10 feet apart.

United States Aerial-defense Gun.—The Ordnance Department of the Army has developed a high-angle fire gun, based on experiments with the Deport gun illustrated in the first war issue of the SCIENTIFIC AMERICAN, which has a split trail and a recoil system especially adapted to firing at a high angle. As the result of important experiments, the Ordnance Department now possesses a gun which it thinks will be superior to the French gun, justly celebrated for its speed and handiness, which will be eminently suited for firing at aeroplanes. The new gun is of greater range horizontally, and it will be possible without moving the carriage to fire the gun laterally at a greater angle than with the present carriage.

Ocean-going Submarines for the Germans.—A correspondent of one of the London daily papers at Copenhagen, speaks of a report from Hamburg to the effect that two unusually large submarines have been completed for the German navy and are making trial trips at the mouth of the Elbe. According to the report these submarines are four times the size of any existing vessels of this type, with a radius of action which will enable them to keep at sea for forty days without having to replenish their oil tanks and stock of stores, or even have recourse to the submarine tender. This would mean a submarine running into the thousands of tons displacement. Such vessels will be built, and at no very distant date. It is quite conceivable that, in view of the enormous offensive power of such a craft, the Germans may be springing a surprise in underwater craft similar to that which they gave with the 16-inch gun in siege artillery.

Science

Survey of Southern Palestine.—A considerable amount of surveying and exploration has recently been done along the southern frontier of Palestine under the auspices of the Palestine Exploration Fund by parties headed by Capt. S. F. Newcombe, R.E., and including two archæologists from the British Museum. Five parties surveyed and mapped the whole border region except a small area around Akaba, where the Turkish authorities refused the necessary permission, and the trigonometrical survey of Palestine was connected up with that of Egypt.

Wolfram, an important source of tungsten, is said to be quite widely distributed through Siam, where its production on a commercial scale is a recent development. According to a recent consular report, it was long known to the Chinese tin-miners in Siam as "dead ore," and supposed to be of no value, until some of the ore was taken to Singapore for analysis and found to be wolfram. Great heaps of this supposedly worthless material had been left by the tin-miners in the mountains of Nakawn Sitamarat (Nakon Sri Tamarat), in the Malay peninsula.

Eye Injuries from Artificial Fertilizers.—In order to test the supposed injurious effects of artificial fertilizers upon the human eye, some experiments with rabbits were recently carried out by J. Eickmeyer, of the University of Rostock. It was found that superphosphates produce a slight conjunctivitis and a transient cloudiness of the cornea; Thomas slag produced a marked conjunctivitis with a transient turbidity of the cornea and residual scars; calcium cyanamid caused a marked neurotic conjunctivitis and also keratitis. When applied to the cornea as a paste these substances showed marked toxicity.

Watering Shade Trees in City Streets.—A very ingenious and practical device for assuring the trees on city sidewalks a sufficient supply of water, no matter how dry the season and how hard baked the earth, has recently been put in operation in Strasburg by Mr. Sauer, the city tree inspector. It consists of a tube of iron or lead bent into the form of a ring large enough to encircle the stem of the tree. The earth is removed so that this ring may be placed just above the roots, and is then filled in again, leaving the end of a pipe connecting with the ring projecting above the surface of the ground. The top of the ring is pierced with a large number of small holes, and a tin cover or shield prevents these from becoming stopped up with earth. By means of a funnel in the protruding end of the pipe any desired amount of water may be supplied to the roots without waste or loss of time. A further advantage, according to *Prometheus*, is the ventilation thus secured of the earth in the vicinity of the roots.

Easter Island, in the South Pacific, is one of those out-of-the-way places that intermittently attract the attention of the world, on the occasion of the rare visits paid them by explorers and travelers. The island is famous for two things; first, for its excessive isolation, and, second, for its colossal stone images and other relics of a forgotten and unknown race. This spot has recently come into special prominence on account of the adventures of a small expedition led by an Englishman, W. Scoresby Routledge, and including an archæologist and a geologist from the British Museum, which set out two years ago, and after much incidental exploring *en route*, ultimately arrived at Easter Island, where a thorough study of the archæological problems of the island was to be made. Hardly had these investigations been begun when a serious outbreak of the natives occurred. As there was only one European in the island besides the members of the English expedition, and the natives numbered about 250, the situation was extremely serious for a time. The opportune arrival of a Chilean man-of-war put an end to the trouble and at last account (August 10th) explorations were again progressing satisfactorily. The island has also been brought into prominence recently by the writings of Dr. Walter Knoche, the German director of the Chilean meteorological service, who visited this remote Chilean possession in April, 1911, for the purpose of establishing a meteorological and seismological station. Perhaps the most remarkable fact in connection with Dr. Knoche's expedition was that a sojourn of only twelve days in the island should have furnished him material for no less than eight important memoirs, published part in Chile and part in Germany during the years 1912-14, and embracing such diverse topics as the meteorology of the island, its songs and folklore, its ethnology, archæology and folklore. After Dr. Knoche's departure the observatory was maintained for a year by Senor E. Martinez, of the Chilean meteorological service. His observations have been published *in extenso* by the Chilean government, and are accompanied by memoirs on the geology, botany, seismology, etc., of the island, by experts in these various subjects. Perhaps the most interesting fact brought out in this publication is the very slight seismicity of the island, as compared with the high seismicity of the Chilean-Peruvian coast.

Automobile

Ambulance Cars.—Many pleasure cars in England have been fitted up as ambulances, both for home use and with the army, and in many cases this is easily accomplished. A light ambulance body is fitted, and this has a special channeled platform, into which the runners of two regulation stretchers slide, a tailboard to keep all fixed, front curtains to screen the interior, and outside seats for driver and attendant. In this design the canvas canopy, which is like a shelter tent, can be rolled up, the frame is detachable so as to allow the platform to be used for the transport of goods and stores if required.

Automobile Situation in India.—According to statements made by a man prominent in French automobile circles, business is progressing in India, and it is estimated that the total number of motor vehicles including pleasure cars, motorcycles and power wagons actually in use in India number over 15,000. More than 50 per cent of this number are of French make. Good roads are frequently met with, and it is possible to make a 1,200-mile trip through the country from Calcutta to Peshawar without any special difficulty. This route allows of visiting all the historic cities in the north of India and numerous garages lie along the route and afford a good supply of gasoline and oil. Gasoline sells for 32 cents a gallon. The best season for automobile touring is from November to February.

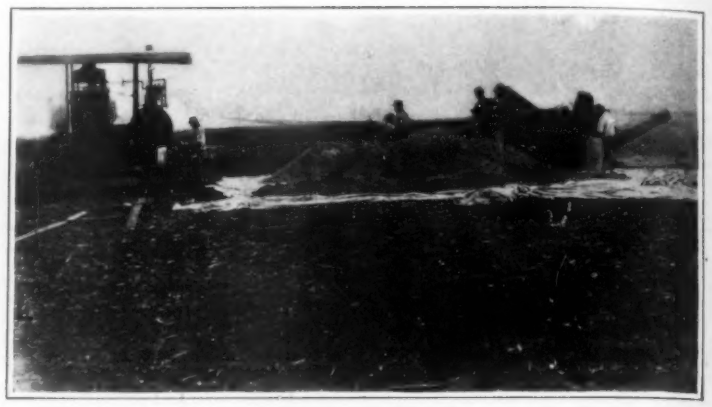
All-Weather Bodies on the Increase.—The number of automobile owners who drive their cars the year around grows apace. And this draws attention to the fact that the type of body which goes under the not altogether euphoneous name "all-weather" is coming into greater demand. The perfection of such bodies to the point where incipient, and not so incipient, rattles have been eliminated has had much to do with their increasing popularity. At the same time, quite a number of car makers now are sending their vehicles out with open touring body and also a detachable top of the semi-permanent type which may be lifted into place and become part of the car directly the snow flies. Naturally, these detachable tops have a wide appeal, for the cost is not high.

Increase in Small Electric Delivery Wagons.—Although the low-price electric passenger vehicle which it is said now is under contemplation by Thomas A. Edison and Henry Ford still remains beneath the horizon, low-priced electric freight vehicles bid fair soon to be common. Within the past few months two vehicles of the kind have appeared on the market. One of them is a four wheeler and the other has but three wheels. Both are comparatively light in construction and are designed for the cheap and efficient transportation of small parcels. That there is a market for vehicles of the kind there can be no gainsaying for the cost of electric current steadily is decreasing and the inherent simplicity of the cars themselves is their own most potent factor of appeal.

Motor Car Factories in Germany.—Most of the motor car manufacturers in Germany are working twenty-four hours each day in an endeavor to keep up with the demands of the army officials, although several report considerable private demand. In most of these factories there is great difficulty in carrying on the work as so many of their workmen have been called to the front, and it is extremely hard to secure skilled labor anywhere in the country now. In some cases the employees of shops engaged on government contracts have been sent back to their work in uniform to enable the work in hand to be completed. A number of factories have been taken over entirely by the government, and some nearer to the scene of activities have been devoted entirely to repairing damages sustained at the front. This is particularly the case of Belgian factories. Besides the scarcity of labor the difficulties encountered are in securing supplies of rubber for tires, and in the transportation of materials required, even in the case of government contracts.

At a Recent Meeting of the British Institute of Automobile Engineers a member delivered a scathing criticism of the manufacturers, which was not challenged, because they relied on the continent so largely for component parts, many of these coming from Belgium, Germany and Switzerland. These supplies are now unattainable and particular mention was made of the difficulties of commercial vehicle manufacturers who have been obtaining the steel castings for their wheels from Germany. The German magneto has also been very largely used in England. Special stress was laid on the inaccuracy of British drop forgings, and it was stated that it was impossible to get certain types of mild steel steering forks except on the continent. The faults of British designers was laid to the lack of really practical men and modern plants at their technical schools and colleges. This dependence of British automobile manufacturers on the continent for supplies of components has become a very serious matter when there is such a pressure for heavy commercial vehicles for army use that even the motor omnibuses have been pressed into service, especially as it makes the possibilities of replacement doubtful.

Drying onion seed in California.



Threshing onion seed.

The Seed Supply and the War

Making Up the Shortage on Our Own Farms

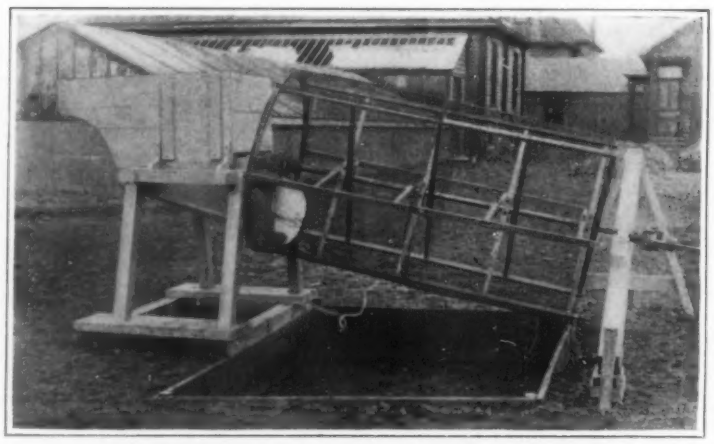
By Guy E. Mitchell

WILL the bumper crop of this year be followed by a lean one next year? Thousands of tons of seeds which are ordinarily imported from Germany, France, and Belgium will never be shipped; indeed, most of it will never be harvested, on account of the war. As a consequence of this shortage of the seed supply the wise farmers of the United States, acting under advice of the Department of Agriculture, have been saving their own field and vegetable seeds.

The greater part of our sugar beet seed comes from Germany and France, and the war is resulting in total destruction of a great part of the sugar beet crop in parts of France, while in Germany the shortage of help prevents the harvesting of the seed. Our sugar beet growers in Michigan, Colorado, California, and the other States in the sugar beet area, will be seriously hampered because of the shortage of seed. Then there are crimson clover and hairy vetch, two plants largely used as cover crops and as soil renewers, both of which are largely dependent on the seed brought from Europe. Farmers in the South and West annually sow large quantities of these two forage plants, the growing plants being used as pasture during the winter, and cut and dried for hay, or plowed under as green manure in the spring. Already the cutting off of the supply of seed from Europe has caused marked advances in the prices of supplies in the hands of seedsmen in this country, and inability to obtain further supplies, and it is believed that it will either be necessary for American farmers to save seed from their own crops or to abandon the use of the crop altogether for a time.

While there has been a note of alarm in a number of the large metropolitan newspapers, as well as in the country press, the seed specialists of the Government have not shown so much concern over the seed situation, for while it is admitted that there will be a shortage in seed, the seeds that we import from Europe—carrot, celery, endive, parsley, spinach, radish, and some kinds of cabbage seed, and other small vegetable, also many of our flower seed, such as pansies, poppy, and verbena—can all readily be saved by the individual grower. The only really alarming feature is that confronting the sugar beet grower. The advice given the American farmer to grow his own seed does not apply to the sugar beet grower, for it requires two years in which to grow the beet before securing seed.

It is a fact, nevertheless, that while the great bulk of our seeds are already grown in the United States—thousands and thousands of acres are planted to seed—the cutting off of importations will tend to raise the price of some seed and make the dealers scurry to supply the demand for next year, for when planting time comes many farmers will be found, to whom it never occurred to save their own seed.



Thresher for separating watermelon seeds from the pulp.

In one of our watermelon seed washeries.

Planting cabbage heads for seed growing in Holland. This method has been tried without success in this country.

There is sharp competition between some classes of seed of American and foreign origin, but in most cases the American seed is the better. Machinery in competition with cheap labor of Europe has helped our people to keep at home money that has been sent to Europe for seed. A few years ago—possibly two decades—we sent to Germany for all our lettuce seed, because it was then believed that our climate was not suitable for lettuce seed growing, and because labor abroad was cheaper. But the climate was found—in California — and American inventive genius followed, so that to-day, instead of buying lettuce seed from Europe, we are supplying not only ourselves, but Europe as well. In Europe, watermelon, cucumber, and canteloupe seed are extracted by hand, the work being done by women, who work from six in the morning until eight at night, diligently scooping out the seeds with a spoon, for 25 cents a day. Here in this country, however, the watermelon thresher does the work and better. The machine is mounted in a motor truck and run up and down the rows. The melons are thrown into a hopper, similar to that on a cider press. Knives chop the melons or cucumbers and the pieces are then crushed between rollers. The mass then passes to a revolving drum, which separates the seed from the pulp. These seeds with some adhering pulp are dumped into barrels and allowed to ferment in order to loosen the pulp from the seeds, later to be washed and dried for shipment. On some small farms the thresher is stationary and operated by a horse. One of these machines operated by one man can do as much work in a single day as that performed in Europe by ten women, and do it better.

What lesson does the American farmer learn from the present seed situation? Let him do for himself with his vegetable and flower seeds what his father and his grandfather did before him before the days of seed dealers—save the seed for himself. The Department of Agriculture is anxious to have the farmer grow his own seed, and return to the independence of earlier days, but grow them intelligently, selecting the better and stronger plants for seed. The seed, after all, is half the crop, and if the shortage caused by the war does nothing more than induce the farmer of this country to save his seed with the utmost care it will result, after a few years, in a gradual increased yield in American crops.

Antiseptic Drinking Fountain.—William C. West, of Kansas City, Mo., in a patent, No. 1,099,002, provides a drinking fountain with a series of cups which are movable successively through a sterilizing liquid.

Mines in the North Sea

THE submarine mine, whether anchored or floating, has added, in the present war, to the reputation which it gained during the war between Russia and Japan. As was to be expected, most of the losses through mines have occurred in the North Sea; but they have not by any means been confined to those waters. In the Adriatic, the Black Sea, the Baltic, and in far eastern waters at Kiao-Chou, this deadly weapon has taken a terrible toll of the fleets of the warring nations.

Mines are of three types—first, ground mines, which are usually of great size and laid directly on the bottom; second, anchored mines, which are attached by a cable to a weight on the bottom, and are designed to float at a predetermined depth, such that they will touch and be detonated by passing ships; and third, floating mines, which are dropped on the surface of the water. It is probable that the majority of the mines which have been planted during this war are of the second or anchored type, arranged to be discharged automatically when they are struck by a passing vessel.

It frequently happens that during heavy storms the mines break loose from their moorings and are ultimately cast upon the adjacent coast. Such a mine is shown in the accompanying photograph, which was taken on the east coast of England on the shores of the County of Suffolk. The mine is a large one, capable of containing anywhere between 300 and 500 pounds of explosive. The group standing by the mine includes two of the justly-famous Boy Scouts, who have been rendering excellent service among those of the warring nations in which the Boy Scout movement is represented.

Photograph by Underwood & Underwood

A mine broken away from its moorings and washed up on the east coast of England.

Loss of the Pre-dreadnought "Bulwark"

EARLY in the morning of November 26th the British pre-dreadnought "Bulwark" was blown up in Sheerness Harbor in the Thames at a point about thirty-five miles from London. Practically the whole of the ship's complement of 750 men was lost, the ship going down within three minutes after the explosion and only fourteen of the crew being saved.

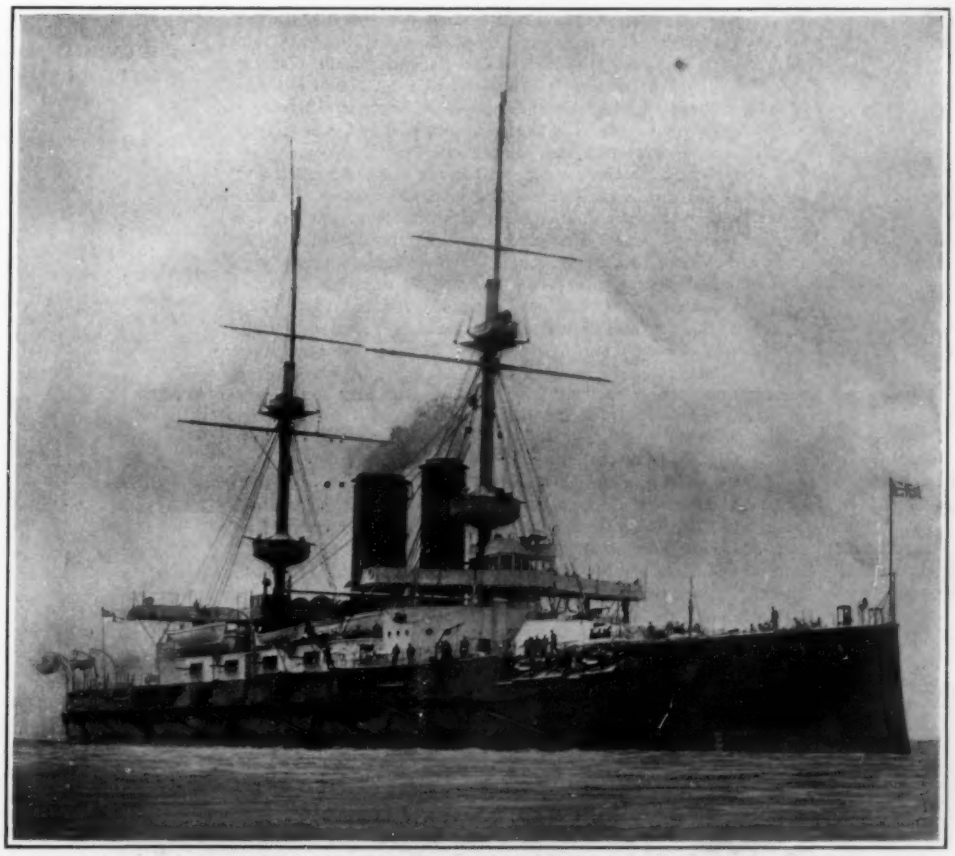
Of the three possible causes of her loss—a mine, submarine attack, or an internal explosion—the last named has been generally accepted as the most probable. No mine-laying by the enemy would be possible at a point so far up the estuary which leads to Great Britain's most important city. In view of the fact that the Thames is heavily mined, it would be impossible for a submarine of the ordinary type to have made its way so far up the river; moreover, the fact that the Germans have made no claim to the destruction of the "Bulwark" coupled with the other difficulties above mentioned, leads to the conclusion that the ship was lost through the explosion of her magazine.

Even if this theory be adopted, the loss of the ship is still shrouded with mystery; for although the "Bulwark" was an old battleship, her design having been gotten out some sixteen years ago, we understand that in the matter of powder inspection and the safeguards to preserve the magazines at an even temperature, the ship was thoroughly up to date.

It is true that the French navy lost one of its finest battleships, the "Liberté," through the deterioration and spontaneous combustion of its powder; but it has since developed that the powder aboard the "Liberté" was of inferior and unstable quality and not comparable in point of safety with the powder carried by the British navy, which for many years past has proved to be thoroughly stable and reliable. In commenting upon the disaster, Lord Charles Beresford said: "It is certain that the magazine must have exploded, but I cannot imagine how it happened. Good cordite does not explode without a detonator, and inferior cordite is excluded by frequent tests. There was a fire a while ago within the magazine of the battleship "Revenge." Sailors quenched it and the magazine did not explode. The magazine of the "Bulwark" was in a very safe position and was protected by every modern device. Possibly a shell or fuse was dropped, but even this ought not to have exploded the magazine."

The "Bulwark" was a pre-dreadnought of early design, she and her sisters, the "London" and "Venerable," having been laid down in 1898 to 1899. She was of 15,000 tons displacement and could make 18½ knots. Her protection was very light for a battleship, the belt being only 9 inches thick amidships. Her battery consisted of four of the old 40-caliber 12-inch guns and twelve 45-caliber 6-inch, and she carried four 18-inch submerged torpedo tubes.

The loss of this ship does not sensibly affect the strength of the first fighting line of the British navy—a fact which will be readily appreciated when we compare her fighting efficiency with that of the "Audacious," a thoroughly modern dreadnought, recently lost off the Irish coast. The "Bulwark" in a single broadside fired a weight of 2 tons of metal; the broadside of the "Audacious" weighed 6⅓ tons. The total energy of the "Bulwark's" broadside, including the 12-inch and 6-inch guns, was 186,000 foot-tons, whereas the "Audacious" fired a broadside of 646,500 foot-tons. The 40-caliber 12-inch guns of the "Bulwark" could penetrate 16 inches of armor at 5,000 yards; but at the same range the 13½-inch guns of the "Audacious" could pass through 22 inches of armor. The 12-inch shell of the "Bulwark" weighed 850 pounds; the 13½-inch shell of the "Audacious" weighed 1,250 pounds, and because of the fact that it contained a far heavier charge of high explosive, the shell had enormously greater destructive power.



Designed 1898. **Tonnage,** 15,000. **Speed,** 18¼ knots. **Belt,** 9-inch. **Guns:** Four 12-inch, twelve 6-inch. **Torpedo tubes,** four 18-inch.

British pre-dreadnought "Bulwark," lost in the Thames by internal explosion.

The Crocker Land Expedition

ON June 24th, 1906, explorer Peary thought he saw through glasses from a mountain peak in Grant Land "the faint white summits of a distant land," which he named Crocker Land, and which has since made its appearance, with or without a note of interrogation, on most maps of the Arctic regions. In fact, the belief has prevailed rather widely that Peary saw the eastern margin of a vast continent or archipelago, filling most of the area that is now blank on Arctic maps. In the autumn of 1913, when Vilkitskii's discovery of Nicholas II Land, near the Siberian coast, was announced, certain wild statements were published in the newspapers as to the probability of this discovery constituting part of the hypothetical continent, although reference to a map of the routes followed by polar explorers would have shown the authors of these statements that, if they were correct, Nansen's expedition in the "Fram" must have drifted over dry land.

In July, 1913, an American expedition sailed from New York with the object of visiting and exploring Crocker Land. It was backed, financially and otherwise, by a number of institutions and individuals, but especially by the American Museum of Natural History, and was commanded by Donald B. MacMillan. This party spent the winter of 1913-1914 at Etah, Greenland, and in the following spring a sledging expedition was made by the leader and Ensign Fitzhugh Green, U.S.N., over the sea ice to a distance of one hundred and twenty-five miles northwest of Cape Thomas Hubbard, i. e., to the supposed location of Crocker Land. The main results of this journey have just reached the world, the principal one being that Crocker Land does not exist. The sledge journey occupied two months, and appears to have been exceptionally difficult and dangerous. All details now available were published on November 25th in the New York *Tribune*, which is the accredited mouthpiece of the expedition. The news came by a somewhat indirect route, and not from MacMillan himself, whose narrative will probably not reach this country until next April or May, unless the attempts which the expedition has been making to send wireless messages from its base at Etah should prove successful before that time.

It is understood that this expedition, the only one from the United States now engaged in polar exploration, will henceforth concentrate its energies upon a journey into the interior of Greenland.

California Imports Timber.—Hardwoods are not abundant on the Pacific coast, notwithstanding that section of the country is so richly endowed with other classes of timber, and it is reported that much of the oak consumed on the Pacific coast is brought from the eastern countries of Asia.

Strategic Moves of the War

Letter from the Military Correspondent of the Scientific American, December 4th, 1914

The Campaign in France.

IN the western field of fighting, we have had the remarkable situation of the armies of four nations confronting each other for two weeks without any extensive operations. The opposing lines include a total of approximately 4,000,000 men, yet neither side is prepared to force the fighting on the scale that is necessary to decide the question of victory.

For the Germans the compelling reason is evidently a strategic one. They are making their greatest effort just now in Russia. Consequently, they are rushing to the east every available man and are depleting the western lines to the minimum force that can hold the Allies back.

Warfare is a game of wits as well as a contest of military strength. The important thing is to have the strength where needed, when needed. The conduct of the campaign involves a study not only of the enemy's resources, but of the mode of thought of his generals. The bold strategy of the German campaign is based on both.

The German General Staff seems to have misjudged the difficulties in their first dash toward Paris. Both the Belgian resistance and that of the British proved unexpected obstacles. The shattering force that was planned for this blow was avoided by the sound strategic plan of Gen. Joffre and his associates.

History and national temperament called for the French to rush to meet the invader. On the contrary, though, and in spite of popular clamor, the French army retreated again and again, allowing the German blow to be "wasted in the air." When the hardships of forced marches and the shortage of food and ammunition had taken the edge off of the German fighting strength, the French struck back in the battle of the Marne, from September 5th to 12th. The Germans made good their retreat, but were forced to fall back fifty miles to the Aisne to reform their lines.

The second great strategic move of the war was the effort of the French and British to turn the German flank between the Oise and the North Sea. From September 15th to the capture of Antwerp on October 9th, the fighting in the west centered on the efforts of the Allies to turn the German right flank and on the efforts of the latter to prevent this.

After the capture of Antwerp and the release of the German forces held for this purpose, the Allies gave their energies to checking the impending German attacks. Their lines were reformed, and the British troops were moved to Belgium, where they would be nearer to their base of supplies. For five weeks the Germans battered at the lines between Arras and the sea in the effort to break through to a Channel port from which they could threaten the British commerce with submarine raids. It was only after repeated repulses with large losses that this project was given up, probably also due to the critical position of the German army on the Polish border.

While Germany is engaged on her present great effort against the Russians her campaign in the west must naturally slacken. The failure of the Allies to take advantage of this temporary weakening of the German strength is just what the latter have been counting on, and enables them to give extra strength to their campaign against Russia.

The fighting in France during the week has consisted entirely of bombardments and minor attacks to feel out the enemy's strength. These were made by only a few battalions and were rarely pushed farther than the first line of trenches. In most cases they were repulsed. The exchange of these gains is slightly in favor of the French, but none of them make any material difference in general positions.

The battle line now follows the Yser River and Canal in Belgium to Ypres. There it runs south through Armentieres, La Bassée, Lens, east of Arras, west of Bapaume and Chaulnes, through Roye, Ribecourt and Tracy-le-Val, and north of Soissons. For a ten-mile stretch at Vailly the Germans hold the north bank of the Aisne, while at Vendresse and Craonne the French have advanced three miles from the river.

South of the Aisne the line skirts Rheims at a distance of four miles and runs through Nauroy, Souain, Vienne-le-Chateau, Four-de-Paris, and then circles Verdun at a distance of eight miles. East of the Meuse the line parallels the river at a distance of eight miles until it bends back sharply from Hattonchatel to St. Mihiel, where the Germans hold Chauvoncourt, immediately west of the river. From here the line bends eastward through Apremont and Thiaucourt to Pagny on the Moselle.

From here southeast to the Vosges the line lies just south of the border. The French now hold the central passes in the Vosges Mountains, while in the south they have gained a ten-mile strip of Upper Alsace, including Thann and Altkirck.

Whatever may be the result of the fighting in Russia, it seems evident that active operations will soon be resumed in the west. If the Germans succeed in the east they will take advantage of it to strike their next blow in the west. If the Russians win out in the present fighting, the Germans will need special efforts to check the Russian invasion. The western Allies would then have a chance to catch their opponents at a disadvantage.

The two most important parts of the western battle line are the flanks. The natural line of attack for the Germans is in the vicinity of Nancy, where they would have the services of their great rail system in Lorraine for moving and supplying the armies. If the Germans are too weak for a general campaign against the French army they may confine their efforts, as before, to a campaign for the capture of Dunkirk or Calais.

For the Allies, the natural line of advance is along the seacoast. Here they would gain the co-operation of the naval vessels and would have the supply of part of their armies simplified by the water transportation. Great Britain would profit by this on account of its effect on the German submarines while Belgium is clamoring for a campaign to recover her territory. It is probable that the resumption of offensive operations by the Allies will be signalized by a further advance into Alsace, but it is considered most probable that this would be only a large scale diversion to draw the German troops southward in preparation for the main advance along the north coast.

The Campaign in Russia.

The German campaign in Poland has been accompanied by varying fortunes that make it the most interesting of the entire war. Their first effort was to draw the Russians southwest toward Cracow and Silesia. Then they let loose their new armies from Thorn to cut off the Russians from Warsaw and thus to compromise their position.

The successes at Kutno and Grabow in the middle of November enabled the Germans to push forward beyond Lodz and Lowicz until they reached the main railroad running from Warsaw to Czenstochowa. Meanwhile the Russians had drawn back their troops from the Warthe and had rushed forward new corps from Warsaw and Brest-Litovsk.

The Warsaw army held the Germans in front while on November 23rd the Russians east of the Warthe moved northward to cut them off. At Kolunski, where the branch railroad to Lodz joins the main Warsaw line, the Russians cut off part of the German advance guard. The Germans fell back to Tuszyn and Brzeziny on a line twelve miles southeast of Lodz, where they were again defeated.

At Zdunskawola and Szadek, six and eight miles east of Sieradz, the German line held fast against the Russian attacks and checked the project to cut off the troops near Lodz. The latter fell back twelve miles farther to a line through Lutomiersk, Zgierz, Strykow, and Glowno, where they checked the Russian attacks.

Meanwhile both armies pushed forward their right flanks. The Germans concentrated a force at Wielun, half way between Kalisz and Czenstochowa, and sent them forward to catch the Russians while weakened by the movement of troops to the north. This attack was repulsed and the Russians were left free to prosecute their campaign in both the Sdunskawola and the Cracow district.

The Russian move was similar to the one that gained them success in the battle of the Vistula in October. From Novo Georgievsk they sent forward a strong Cossack army that advanced along the south bank of the Vistula as far as Gombin, ten miles south of Plock. Here they were checked by the German reinforcements, but their advanced position forced the Germans to abandon Lowicz and to fall back ten miles to a line through Sobota. Here they have strengthened their line and are resisting energetic attacks by the Russians.

On December 1st the Russians showed a still wider flanking move in their occupation of Plock on the Vistula River, half way between Warsaw and the German border. The advantage that they hold in their large number of cavalry divisions enables them to spare a strong mobile force for a move north of the Vistula to threaten the German communications from this side.

In the Cracow district the Russians checked the Austrian advance on the line through Pilicia, Wolbrom, and Miechow. In Galicia, the Russians made a notable gain and have advanced from Tarnow to Bochnia, on the Raba River twenty-eight miles from Cracow. Further south, they have gained the headwaters of the Donajec River and have crossed into Hungary. At Bartfeld, Meso Iaborcz, and Uzsok the Cossack detachments are beginning to debouch into the valleyheads of the Theiss River.

In East Prussia there has been no change during the week. Both sides seems to have diverted a part of their strength to the more important campaign in Poland.

The fighting in the east now forms practically one big battle from the Carpathians to the Baltic Sea. The outcome of the fighting in any one district, accordingly, influences that in all of the others. The critical point is, however, between Warsaw and Thorn. If the Germans win out here, the Russians will have to abandon their campaign against Cracow in order to make a hurried retreat to the shelter of the Vistula River to reorganize their armies. If the Russians win in the fighting south of Plock, the Germans will have to fall back rapidly to their border for a like refitting and reorganization.

A Gyroscopic, Motor-driven Unicycle

THE idea of a single wheeled vehicle is by no means new. A foot-propelled unicycle was described in the SCIENTIFIC AMERICAN over thirty years ago, and ten years ago we described a motor-driven unicycle, which had then actually been built, but had not been tried out on the road. The novelty in the motor car shown on our front page, this week lies not in the fact that it is a one-wheeled vehicle, but that it is stabilized by a gyroscope.

The machine has not been built, but the design has been offered by one of the readers of the SCIENTIFIC AMERICAN as a suggestion to some enterprising inventor. If the unicycle is ever to prove a success, the gyroscope would undoubtedly prove serviceable in giving the vehicle stability.

As shown in the illustration, the idea is to build a large wheel with a track on its periphery and mount the car inside the wheel in a frame provided with three rollers adapted to run on the track. The motor is situated in the bottom of the car and drives the bottom roller by friction. The car tends ever to ride up the track inside the wheel, throwing the center of gravity of the wheel forward of its geometric center, and thus causing it to revolve. The gyroscope, in the bottom of the car, consists of two wheels traveling in opposite directions. It maintains the wheel normally in vertical position. When it is desired to make a turn the car body is displaced laterally with respect to the frame in which it is mounted. This causes the wheel to lean, and hence to turn accordingly. In the motor-driven unicycle we described ten years ago, steering was effected in a similar way, except that the driver himself swayed his body to one side or the other in order to tilt the wheel. In the present machine, as the gyroscope maintains the car body in upright position, the movement of the driver will have practically no effect upon the vehicle as a whole. But by operating the steering wheel, he may tip the big traction wheel to one side or the other. The gyroscope makes side props unnecessary when the vehicle stops.

A Prize for a Trade-mark

E. MOULIÉ, a manufacturer of perfumes in San Diego, Cal., who is a believer in trade-marks, and who is about to introduce some new products, is offering a $20 gold piece as a prize to be awarded to the person who suggests the best trade-mark for perfumes made from San Diego flowers, and the conditions are as follows:

The trade-mark is for "San Diego Flower Perfumes," and the trade-mark name must be limited to three words at most. There is no need of using "San Diego" nor "flower perfumes" nor any name at all. The trade-mark is more intended to advertise San Diego than the goods it will cover, because Mr. E. Moulié's registered trade-mark "Maiden's Dream," covering the full line of his production, has been known for one third of a century; therefore, the trade-mark name of this contest must be appropriate and suggestive of San Diego's beauty.

This contest is open to everyone, and as many suggestions can be sent as desired. The suggestions are to be sent to E. Moulié, 724 Broadway, San Diego, Cal., before December 15th, and the decision as to the best trade-mark and the winner of the prize will be made by Messrs. Munn & Co. immediately thereafter.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Organized Efforts to Bring About Peace

To the Editor of the SCIENTIFIC AMERICAN:

The publicity given the various points of view on the war situation and the causes leading up to it, and statements put forward by each side as to the responsibility for the present cataclysm, do not, with but few exceptions, suggest any remedy or any tangible method of dealing with present and possible future conditions toward bringing to an end the awful destruction of life and property now shocking the civilized world.

Is it not now time that active thought and attention be given to what is before, rather than to what is irretrievably of the past?

Everyone stands horrified at the war spectacle, yet there is no organized effort openly discussed whereby public opinion can make itself felt and thus become a potential factor in possibly shortening the war. That this unexpressed public opinion is on this question a mighty leverage with officials high in authority, is indicated by the appeals from the belligerent countries and their advocates here for the moral support of the people of this and other neutral countries.

It is idle to say that if properly organized the overwhelming public sentiment against the continuation of the present unbearable conditions throughout Europe would not hasten the termination of the conflict. The time may not be yet ripe for peace to become established on a sure and stable foundation; but let us ask what better opportunity for an earnest effort toward this end will be possible after one or more of the great nations are reduced to a point of exhaustion? When such a point is reached, then, by the very process of reapportioning and surrendering territory under the old "spoils-of-war" method, is not the sure foundation thereby laid for another cataclysm just as soon as the subdued people can recover sufficient strength for the conflict?

Is it not now pertinent, indeed the duty of all from the history of the past, to look forward and ask ourselves whether the last conditions of all the countries at war will not, if the contest goes on to exhaustion, be worse than the first? Has national hatred there, combined with the brutalities of war, reached a point where nothing can induce the belligerents to stop and listen and look to some better way for adjusting differences than to permit the greatest of the world's wars to be fought out to the bitter end and under the relentless horrors of barbarism?

It is gratifying to observe those with such divergent views on the question, as for instance Col. Roosevelt and Dr. Nicholas Murray Butler, agreeing in the main with that versatile publicist, Lord Bryce, that an effective prevention of future wars must rest on a binding mediation agreement between nations, not only as to submitting differences to arbitration, but also to the enforcement of the conditions by all against any country which may disregard its obligations.

While this is a delicate subject to work out under present conditions, should twenty-five or thirty favorably well-known and earnest publicists, inspired by a common purpose, get around a table, and the energies of the country look and work forward to accomplishing this end, I believe that a plan could be devised which would at once enlist the co-operation of the people of other neutral countries and make such a result as practicable as the need is urgent.

A well-organized committee could readily be formed of which every name would carry the weight of international influence, and would inspire confidence in the assurance of wise and discreet action in dealing with the vast interests and intricate questions involved.

Is it not worthy of trial? Or shall the country and the world stand aghast, impotent, and helpless, continuing to discuss causes, when the present and future results are of such colossal magnitude, not only to the people of this and of all countries, but to the very heart and fiber of civilization itself?

FREDERICK W. KELSEY.

The Institute of Human Palæontology, under construction in Paris, lies not far from the university quarter. It is endowed by the Prince of Monaco. The institution is to be devoted to researches upon questions relating to prehistoric man and his evolution, and numerous laboratories will be equipped for this purpose. The building will also contain space for numerous collections of prehistoric human remains, lecture rooms, and the like. Handsome bas-reliefs showing primitive man in various groups decorate the outside of the new structure.

The Work and Needs of the United States Patent Office*

By Thomas Ewing, Commissioner of Patents

MR. PRESIDENT and Gentlemen of the Patent Bar Association: When I first took hold in Washington, in August, 1913, I found that there were a great many applications which had been pending for a long time. A count made later on showed that on June 30th, 1914, there were pending over 31,000 applications which had been in the office more than two years. Of these, 4,231 had been pending over five years and 241 ten years or longer. There were 52 cases that had been in the Office more than fifteen years, and one old parent case with a litter of eight divisions has been pending since 1880.

Bringing Amended Cases Up to Date.

I issued an order that no amendment should be entered in a case which had been pending in the Office for fifteen years without being first called to my attention. The period has been lowered since, and on December 1st the order will apply to all cases which have been pending in the Office for five years or longer.

If an amendment is filed in such a case which puts it in condition for allowance or final rejection, it will be accepted, but if the amendment does neither of these two things as, for example, where an applicant undertakes to put in new claims, that application is hooked. I do not object to a little play, but unless the attorney is too cute for me, the application never again gets off my line and out to sea. The attorney is notified by a personal letter from me that he must file a supplementary amendment the character of which is indicated, to put the case in condition for allowance or final rejection; otherwise the amendment which has already been filed will be refused admission and the case when the year is up will be held abandoned.

By this method the number of old applications has been greatly reduced. The exact extent of the reduction will not be known before the 1st of January, when another count will be made. We have kept track of the fifteen-year applications, and the count shows that on January 15th, 1914, there were 81; on June 30th, as above stated, there were only 52; and to-day, November 19th, 1914, there are 36.

The importance of getting rid of these old cases is very great. Mr. Oldfield, the chairman of the House Committee on Patents, and I are engaged in a friendly race; he to change the law, and I to change the facts so that his proposed legislation will not be deemed necessary.

I know the difficulties with which the attorneys have to struggle. I know how a busy office will suddenly become a cyclone center when some preliminary injunction motion or when necessity for the preparation of a court case makes it impossible to give attention to other matters. None the less I feel that it is the duty of the Bar to assist me, because the present law, giving to every applicant one year to reply after each action, is in some cases a privilege which is almost vital. This is particularly true where an inventor is working with inadequate means and inadequate legal and engineering advice, and in the face of great difficulties is perhaps undertaking to develop some important and intricate invention, the exact lines of development of which are not clearly foreseen. The big concerns with ample capital and large force are not nearly so likely to be embarrassed by the changes in the law which Mr. Oldfield proposes. But in the interest of everyone practising before the Office, it is desirable that the liberality of the law be not impaired.

Reducing the Number of Interferences.

Interferences have been a great source of trouble to the examiners and to applicants. There are altogether too many of them. With each one of the forty-three primary examiners declaring interferences wherever thought necessary, and each examiner who declares an interference hearing all motions to dissolve it, so that an interference once started could only be dissolved by inducing the examiner to reverse himself, the burden upon the Office and upon the public has become one source of serious criticism of the patent system. There are only two law examiners to help with the work of the Commissioner. One of these for eleven months has been devoting his entire time to going over with the examiners all proposed interferences before they are started, with the result that 25 per cent of those proposed by the examiners have never been started. In order to effect this reduction, a practice has been tried, among other things, of not establishing interferences where the difference of dates of filing of the applications involved exceeds two years. A count has recently been made that shows that where the difference of filing dates exceeds one year, the junior party has won in only about 6 per cent of the cases. If a one-year difference were adopted, about twenty interferences a month would be avoided. As a rough method of avoiding a large amount of work without actual loss of the right to a party who desires to start an interference with his rival after one of the patents has been granted, it has attractions which I must frankly tell you I am not able to resist.

* Address before the Patent Bar Association, Chicago, November 19th, 1914.

[Division of Applications.

Then there is the vexed question of division of applications. There are about 7,000 requirements of division made in the Office every year, or one in every ten applications on the average. These were formerly reviewable by the Commissioner on petition, but the Supreme Court of the United States in the Steinmetz case held that the question involved is one of merits and must go to the Board on appeal. Few appeals are taken because, as a rule, it costs nearly as much to take an appeal as it does to file a divisional application. The Board, while enforcing the rule, has been, however, none the less quite liberal. It has permitted in proper cases the joinder of process and product, of machine and product, and in one case, of machine, process and product, all in one application. It has, however, held that distinct and separate inventions cannot be claimed in the same application, and under the rule respecting genus and species, has limited the applicant to claims on the genus and one of the species. Its conclusions are believed to be in accordance with such decisions as Sessions v. Romadka, 21 F. R., and Gage v. Kellogg, 23 F. R.

The attorneys and the courts are not much inclined to recognize the difficulties with which the Office struggles in this matter. For example, in Benjamin Electric Company v. Dale Company, 158 F. R., Judge Lacombe, commenting on a requirement of division whereby the applicant was obliged to take out four patents to cover the subject-matter of his original application, said that the natural way would have been to let him claim the whole matter in one patent. The natural way, according to Judge Lacombe, was to ignore the fact that there are 1,100,000 patents and that the subject-matter of each application must be assigned to its proper class for examination before patenting and the patents issued must be properly classified so that they can be found hereafter in further searches. None the less I own that the subject is one respecting which the practice of the Office is troublesome and not uniform. If I can get another law examiner, I will publish the important opinions of the Board upon division and permit any attorney who objected to a requirement to bring the matter before a law examiner for discussion with the examiner who made the requirement. This, I believe, would reduce the difficulty to as narrow limits as are practicable, in view of the legitimate demand of the Office.

The Fitness of Examiners.

There is a general attitude of the profession toward the Patent Office which I think is unwarranted in fact and is regrettable because of its consequences. In an argument in the Third Circuit some years ago one of the counsel, a man of great eminence and of splendid qualities, undertaking to rebut the presumption which arose out of a certain action taken by the Office, in answer to a question by Judge Lanning, said that he accounted for the action in this way: "The Patent Office at that time—the examiners are small men as you of course know, they are not judges and not very good lawyers—thoughtlessly and carelessly assumed . . . that the two arts were distinct."

Every examiner passes upon between 500 and 600 cases to one the judge doing an average amount in patents will pass upon. It is true that the examiners are a good deal younger men than the judges on the average, but Dr. Pond, who recently resigned, had been on the examining corps for forty years and a primary examiner for thirty-four years, and Dr. Wilkinson has just resigned as primary examiner to become first assistant, in order to be relieved of a part of his duties after fifty years of service on the corps.

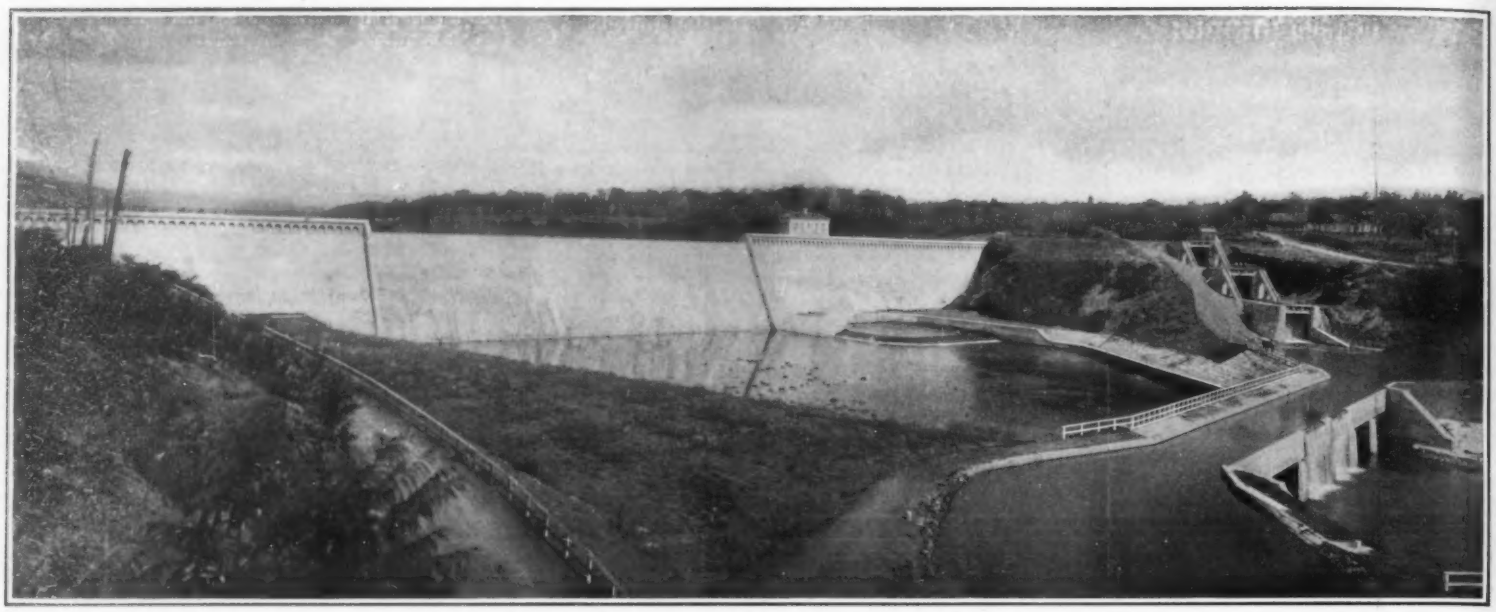
We have recently been having papers prepared by the members of the examining corps and read at meetings held once a week. These papers are being printed by the corps. On the average, they are on a very high plane and some of them display remarkable acuteness and learning.

Respecting those questions which come within the range of the duties of the examiner, there is no such superiority of judgment as the Bar and the courts are disposed to assume for themselves. The Office, moreover, has one great advantage over the courts, in that it understands the subject-matter under discussion, which many a judge decides patent cases without ever understanding.

I think that this attitude toward the Office arises mainly out of the fact that attorneys begin by soliciting patents and grow with the patents into the work of the courts. There is of course another basis for it, namely, that the searches made cannot be as thorough in all of these cases as the searches made in those particular cases, less than 1 per cent, which afterwards are litigated.

The appropriation for salaries for assistant examiners amounts on an average to about $10 for each

(Concluded on page 497.)



The Delta reservoir dam. Capacity 2,750,000,000 cubic feet.

New York State Barge Canal

A Waterway Rivaling in Some Respects the Panama Canal

By Ray Francis Yates

JOHN A. BENSEL, State Engineer, announces with assurance that the new barge canal will be open for navigation in 1915, a statement of great concern to the people and welfare of New York State. The new waterway is the greatest canal-improving project ever attempted and one of the greatest undertakings ever started in the history of the world. Much credit is due to Engineer Bensel, who, as a guiding spirit for this great problem, has shown unusual ability and engineering instinct that places him foremost among our most eminent engineering workers of the day.

In some ways the new barge canal as an engineering work rivals that at Panama. A total of forty dams have been built, rivers have been canalized, numerous locks have been constructed, 248,056,800 cubic yards of earth have been removed. To this is added 6,137,100 cubic yards of excavation necessary for the erection of dams, locks and other structures that are connected with this great waterway. To defray the expense of the new canal and the fifty terminals that are to be constructed along its course, the State of New York appropriated $128,000,000. While this figure of expense is far below that required for the Panama canal, it must be remembered that the barge canal is being constructed in a temperate zone, where labor and working conditions are not so severe as those on the Isthmus.

For a distance equivalent to more than one half its length the new canal passes through natural streams which have been converted into canalized rivers. In reality the barge canal is an elaborate system of waterways, the most important one being that which replaces the Erie canal. The branches, three in number, are: the Champlain, the Oswego, and the Cayuga and Seneca. The Champlain canal connects the eastern terminus of the main canal with the head of Lake Champlain. The Oswego canal branches off the main canal at a midway point and runs due north into Lake Ontario. The Cayuga and Seneca connects the main canal with both Cayuga and Seneca lakes. Including the branches, there is 790 miles of navigable waterways, constituting the new canal system. Of this figure 440 miles has been constructed and the remaining 350 miles lies through canalized streams. To tame the Mohawk River to navigation alone necessitated the construction of ten dams.

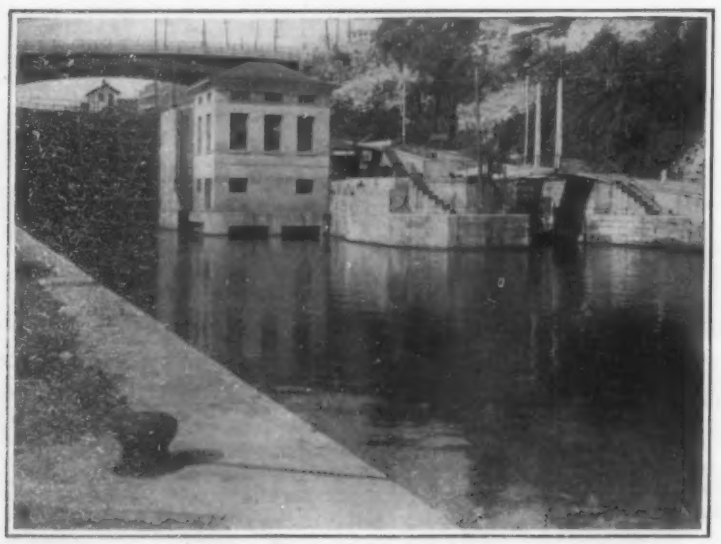
In the construction of the barge canal system, the old Erie canal was widened to 75 feet and deepened from 9 to 12 feet. These figures are standard on all branches of the system. The most important streams and lakes utilized are: the Mohawk and Clyde rivers, Wood Creek, and Cayuga and Seneca lakes.

The canal has two summit levels. One is situated near Rome, and the other at the western terminus. An adequate supply of water for the western summit level was secured by tapping the Niagara River. The problem of obtaining a sufficient supply at the Rome summit level was, however, a more difficult problem and necessitated the erection of two large reservoirs. One of the reservoirs, the Delta, located on the site of the former village of Delta, which was removed to permit of its construction, has a capacity of 2,750,000,000 cubic feet of water, and was erected to impound the waters of the Mohawk River. The wall forming this great reservoir is 1,100 feet in length, 300 feet of this being used for a spillway. Exactly 90,000 cubic yards of concrete was used in the construction of the wall. The water supply of this reservoir is obtained from the natural drainage of 137 miles of land.

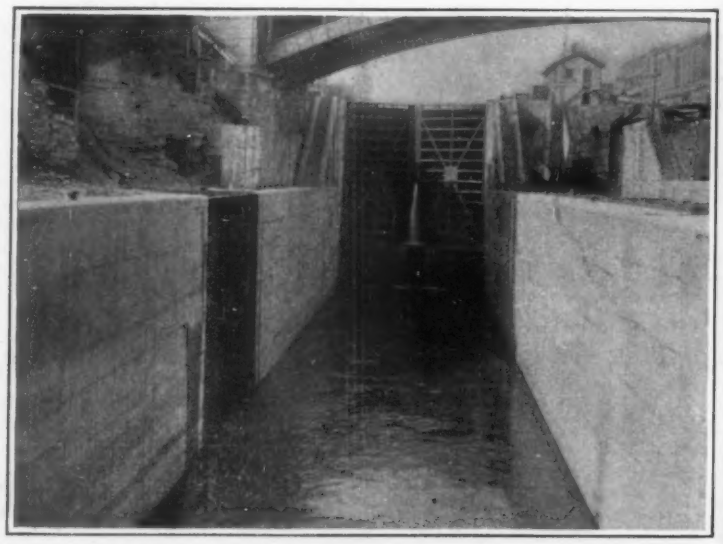
Another great reservoir which forms a feature of the canal system is built across West Canada Creek at the village of Hinckley. While the concrete work on this reservoir is not as elaborate as that on the Delta, it has a far greater capacity and is equally important. The wall here is 3,700 feet long and capable of retaining 3,445,000,000 cubic feet of water. It is formed with a wall of concrete which is reinforced with earthen embankment. The masonry on the wall totals 721,200 cubic yards. Both the Delta and Hinckley reservoirs lie in the slopes of the Adirondacks and receive their entire water supply from the precipitation of this region.

There are also many movable dams of the bridge type on the canal, and, where local conditions permit, dams known as the Taintor type have been constructed. Near the village of Herkimer on the Mohawk River a dam of the Poirée type has been erected. This dam is the first of its kind to be built in America. It is technically known as the "hook-needle" dam, and is formed by suspending a series of timbers or "needles" across the stream in such a way that their position, which is adjustable, controls the amount of water flow.

The barge canal is equipped with a total of fifty-seven locks, thirty-five of this number being along the Erie branch. Near its eastern terminus, the canal has five of the greatest lift locks in the world. It is here where a boat is lifted 169 feet within a mile and a half distance. Lock No. 17, at Little Falls, bears the dis-



Old and new locks at Lockport. Hydro-electric station in the foreground.



A lock chamber with a lift of twenty-four and one half feet.

tinction of being the greatest lift lock in the world. It is capable of lifting a barge 40½ feet. This is also the only lock on the canal utilizing a lift gate.

The only siphon lock in this country has been constructed on the Oswego branch of the canal system at the city of Oswego. This lock is the largest in the world employing the siphon principle. The culverts are formed in a swan-neck manner, and are above the water level much the same as a hose is placed when used for a siphon. All air is excluded except that which is admitted through the operating pipes. The flow of water is established in the siphons by rushing water through them from supply tanks nearby. The lock chamber may be filled in 5 minutes and emptied in 6 minutes by this method, the entire operation being controlled by the manipulation of 4-inch air valves.

With very few exceptions, all the locks on the new canal are identical in general construction and a description of one set will suffice for all. The locks at the city of Lockport are very interesting, and will be described as an example. There is only one other location on the canal where it was found necessary to place two locks immediately adjacent to one another, as is the case at Lockport. This occurred at Seneca Falls. Before the new locks were constructed at Lockport the drop of 49 feet was accomplished with five locks of the old type. There were two of such columns, and one column was completely obliterated to make room for the new locks. So rigid were the great stones of the old lock placed that in many cases very severe charges of dynamite had to be used to dislodge them.

The new locks, in which 62,000 cubic yards of masonry were used, measure 45 feet in width, 46 feet in depth and 311 feet between gates, being capable of accommodating a 3,000-ton barge 300 feet in length. This capacity is approximately six times the capacity of the old locks, which were only 100 feet long and 18 feet wide. In the construction of locks throughout the canal, where a rocky bed existed an artificial bottom was not constructed. Otherwise a concrete floor was installed which was underlaid with piles driven into the ground.

The locks are electrically operated in every detail, reducing the human effort in locking a boat to a minimum. The gates, which are of the girder type and weigh 47½ tons each, are driven by 7½ horsepower General Electric direct current motors by means of a rack and pinion system. The extreme motion of the gates automatically opens the motor circuit by the operation of a limit switch. The gates may be opened in one minute. Means are also provided to open the gates by human force in the event of the electrical equipment becoming disabled.

The valves, which weigh 7½ tons each, are also operated by motors of the same type as those used on the gates. The valve consists of a large slide which passes over the mouth of the culvert. The slides are suspended on chains with suitable counterweights. The chain wheels, which are connected to the motor through a train of gears, pull the slide at the rate of 6 feet per minute. The valves are also equipped with limit switches and means of control in case of mishap.

Electrically driven capstans are provided for each lock, which are capable of moving a boat 60 feet per minute. These are driven by a 20 horse-power direct current motor.

A master controller is located at the side of each lock, and one man may lock a boat through without moving from his position. A clever system of signal lights indicate the different positions of both gates and valves when they are being opened or closed.

The power used to operate the electrical equipment of the locks is generated by the head of water available at the top of the drop.

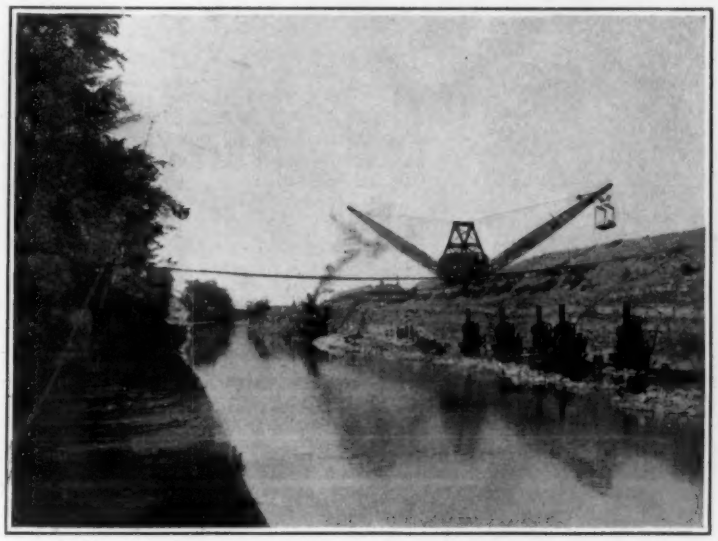
Outside of the numerous locks, dams, and reservoirs that have been constructed, 400 other structures have been built. These include guard-gates, spillways, breakwaters, docks, and aqueducts.

The canal, when completed, will have fifty terminals located at different cities and towns situated along its course. The terminals will be thoroughly equipped for both the shelter and handling of freight. Every terminal will be owned and operated by New York State, and by no means will any private concern be allowed to construct or maintain a terminal.

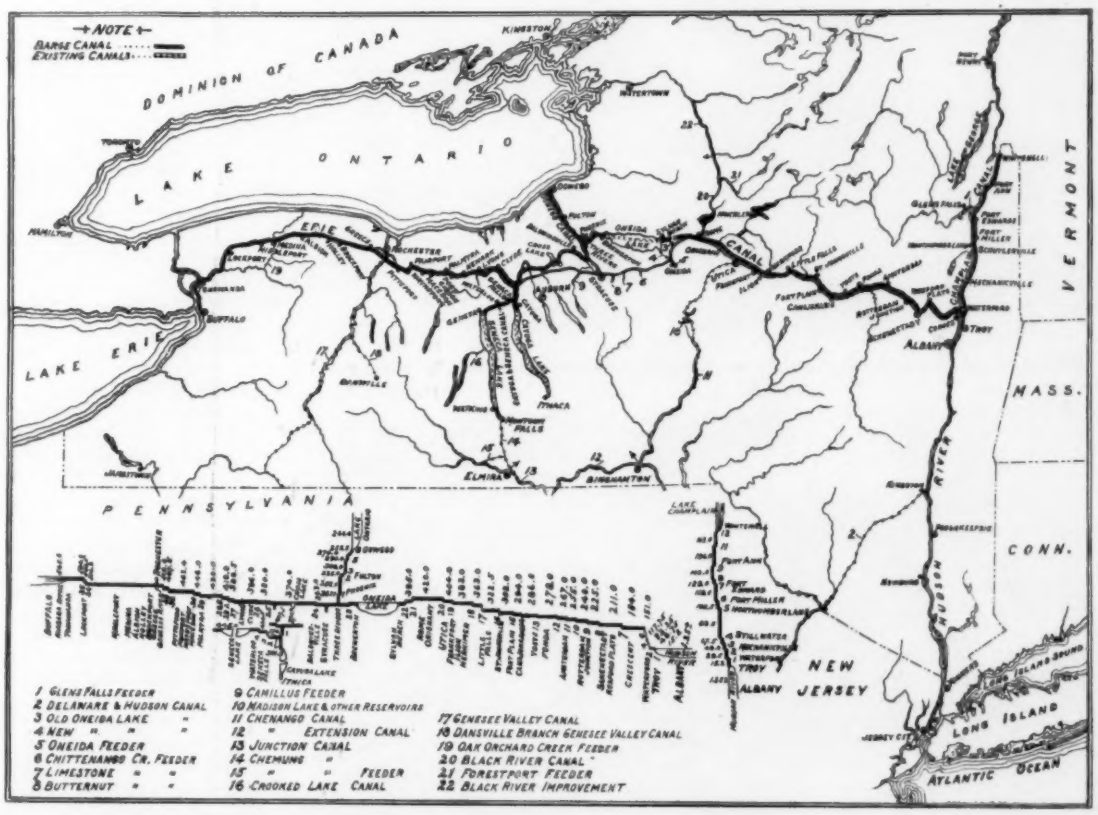
Approximately 1,200 cubic feet of water flows into the canal per second, which will permit of 10,000,000 tons seasonal traffic. This figure may be increased to 20,000,000 tons without overloading the canal.

Just what design of boats will be used on the new canal cannot at present be definitely ascertained. It is prophesied, however, that the barges will either operate by gasoline or electricity. It is rumored that already there is a company organized and contracts let for the construction of thirty electrically propelled barges. Many think that one power-carrying boat pulling three others would be a practical arrangement.

It is an astonishing but true fact that, including Lake Erie and Lake Ontario, 73½ per cent of the total population of New York State is within two miles of the canal. It is anticipated that with the opening of the canal the commercial application of the motor truck will be greatly broadened in the State as some means of transportation will be needed to carry freight from the terminals to adjacent cities and towns.



A battery of channelers at work on the canal.



Map and profiles of the New York State barge canal.

A tipple incline conveyor excavating machine at work on the canal.

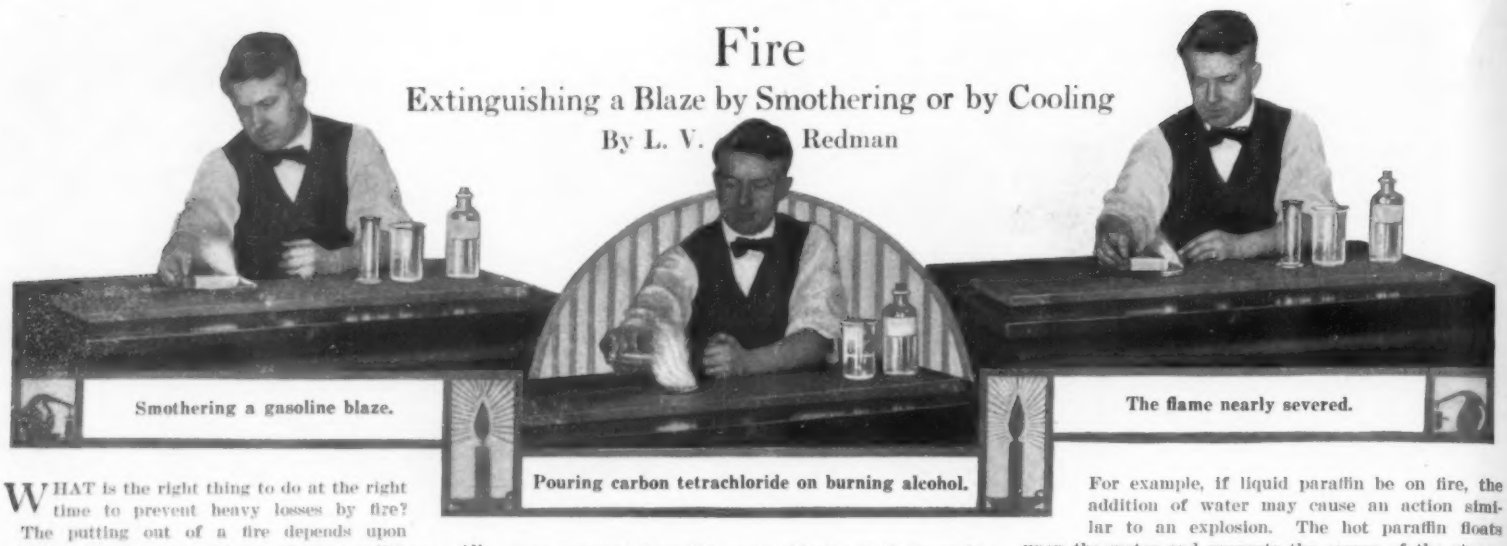
Production of Radium in Europe

ACCORDING to a writer in *Radium*, the Austrian government—the largest European producer of radium—obtained 2,014 milligrammes of radium element in the salts produced in 1911 and 1,698 milligrammes of radium element in 1913. The data on production in 1913 is not yet available so far as the writer is aware, and while strenuous efforts were being made to increase the output in 1913 and 1914, it is doubtful whether more radium will be obtained than in preceding years. The Austrian radium is produced from the Joachimsthal pitchblende. Other European producers use Cornish pitchblende, and Portuguese autunite. Considerable Colorado carnontite was shipped abroad in 1912 and 1913.

Fire

Extinguishing a Blaze by Smothering or by Cooling

By L. V. Redman



Smothering a gasoline blaze.

Pouring carbon tetrachloride on burning alcohol.

The flame nearly severed.

WHAT is the right thing to do at the right time to prevent heavy losses by fire?

The putting out of a fire depends upon bringing into operation either of two conditions: All air should be excluded and the fire will die out for want of oxygen; or the burning materials should be cooled below the point of ignition.

Such ready to hand methods as throwing a blanket or coat tightly over a burning object to exclude the air, placing a lid on a pan or pot of flaming grease, or covering a burning object with a fine non-combustible powder, viz., washing soda, fine sand, clay, etc., will in general put out the fire.

Burning gasoline, as shown in one of the photographs, is being extinguished by the operator sliding a flat glass plate over the vessel, thus excluding the air. The flame is severed from the gasoline as if it were cut off by a knife. Another picture shows the operation almost completed. The popular and altogether false idea that such liquids as kerosene, gasoline, alcohol, benzol, etc., are in themselves explosive, and will burn in the absence of air is erroneous, and it should never be forgotten that these liquids cease to burn when the air is cut off. The cover should always be made to slide along horizontally, for if it be dashed down on the flame from above, the rush of air will cause the flame to burst out in all directions around the plate toward the operator as well as away from him, and may set fire to the clothing or hair.

The second principle, i. e., the chilling of the burning materials to a temperature below the point of ignition is brought into effect when cold sand, clay, snow, or water is thrown upon a burning surface, or when a rapid current of air removes the heat more rapidly than the combustion is producing the same. There is a temperature for every substance below which it will not burn, e. g., if wood be chilled below 155 deg. Cent., i. e., 311 deg. Fahr., it will not readily burn.

Everyone is familiar with the blowing out of matches by the wind, which cools the match below the point of ignition. Fire rangers put out spreading grass fires in this way, by beating the burning grass into the colder earth and chilling the stubble below the burning point.

Nor will iron burn if kept below a red or even white heat. To be sure, everything burns, i. e., oxidizes at almost any temperature. Wood weathers and decays at ordinary temperatures and iron rusts and oxidizes in the cold air of winter, but very slowly, so that we do not ordinarily consider or think of it as burning. The word burning or combustion is used here in the popular sense of being oxidized at such a rate that the chemical reaction is accompanied by a flame or a visible glowing surface.

In most fire extinguishers, either or both of these principles are involved. When water is thrown upon a fire to put it out, the result is plainly to cool the burning materials below the point of ignition, although when the material is flooded with water, the air is also excluded.

When a fire extinguisher, like soda, is thrown upon a burning surface, the result is more or less twofold. The cold powder helps to chill the flaming material below the point of ignition, and at the same time excludes the air by two means: first, by giving off carbon dioxide, and, second, by covering the burning surface with a non-inflammable material.

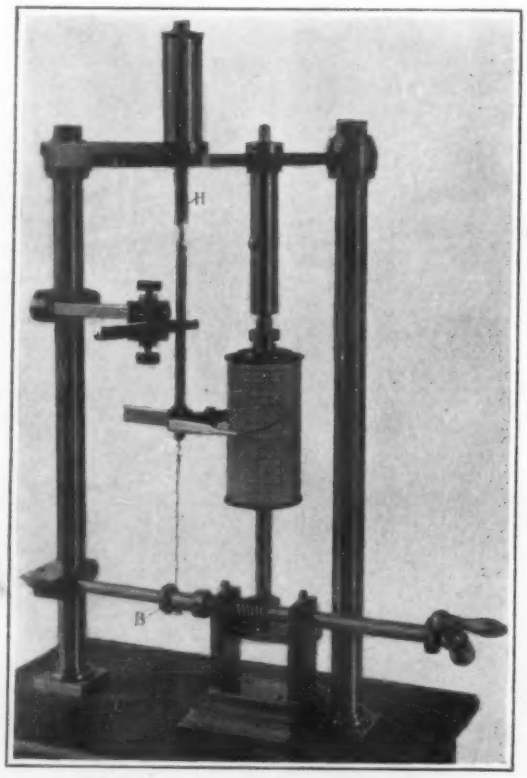
In recent years, quantities of chlorinated hydrocarbons have been prepared from the waste chlorine in the manufacture of caustic soda. The lower hydrocarbons saturated with chlorine are fire extinguishers of a very valuable type, and are sold under many trade names. Carbon tetrachloride is the lowest and the most common of the series. It is also sold as a non-inflammable liquid to take the place of gasoline, benzol, alcohol, for removing grease stains from clothes.

The special value of carbon tetrachloride consists in its non-corrosive properties, e. g., it may be poured into a burning motor without doing the motor any after damage, such as rusting, and the fire is immediately extinguished. In this respect, it is superior to water, as a fire extinguisher. However, tetrachloride is of little value in extinguishing flames from vessels containing burning alcohol, acetone or other liquids with which the carbon tetrachloride does not mix readily.

The operator in one of the photographs is shown pouring carbon tetrachloride from a glass cylinder upon a dishful of burning alcohol. The tetrachloride has no effect whatsoever in stopping the flame, nor does it put out the fire if it is sprayed into the burning alcohol. Fires of this kind can be best smothered out as shown in the pictures at each side by cutting off the air.

It has not occurred to the reader, perhaps, that sometimes it may be positively dangerous to throw water on a flaming material. Yet such is the actual condition. For example, if liquid paraffin be on fire, the addition of water may cause an action similar to an explosion. The hot paraffin floats upon the water and prevents the escape of the steam, until suddenly the steam escapes with an explosive rush carrying the flaming paraffin in a burst of blaze which almost fills the room, and the burning proceeds more violently than before. The same phenomena is noticed with all burning oils and easily combustible liquid organic substances, which float on water. Burning benzol, benzine, naphtha, gasoline, kerosene, acetone, etc., all burn in the same way, so that for these fires, water may not be used; but sand is one of the best known extinguishers. Cold sand thrown on the burning material chills it below the ignition point, and the fire is put out.

A barrel of fine sand standing in a readily accessible place is a most valuable fire extinguisher to possess. If the sand is fine and clean, it is easily scattered over the burning surface and chills the surface below the point of ignition as well as excluding the air. The sand is easily swept up and removed after the fire has been put out, and everything that has not been damaged by the fire remains in perfect condition.



Machine for testing watch springs.

Fig. 1.—Spring wound-up.

Fig. 2.—Spring unwound.

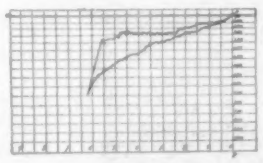


Fig. 3.—Spring of good quality after 6-year run.

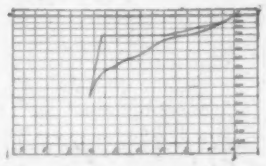


Fig. 4.—Same as in Fig. 3, after cleaning.

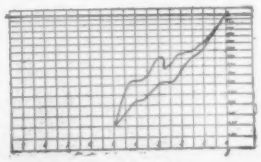


Fig. 5.—Curve traced by a watch spring of poor quality.

Diagrams made by the testing apparatus. The upper curve shows winding and the lower unwinding.

Watch Spring Testing Apparatus

By the Paris Correspondent of the Scientific American

A SIMPLE and accurate device for testing watch springs is the invention of M. Charles Poncet, chief of the national watch-making school at Cluses, in the region of Geneva. In this way it is possible to observe the value of a spring as shown by its regular working, by means of a curve inscribed on a chart. It is well known that in the usual spring barrel of a watch, the spring is wound up close around the center shaft by a watch-key or otherwise, then the spring, one end of which is fastened to the barrel, begins to unwind slowly, causing the barrel to revolve. When all unwound, the coils of the spring now lie around the inside of the barrel and the shaft is free. Between these two positions, the spring has a variable tension, but by the use of good quality springs, the tension can be made more regular, which is desired for the good working of the timepiece. With the new instrument it can be seen at a glance just how the spring is working at any time, and whether its force is regular or not.

Our photograph shows the appearance of the new watch spring testing apparatus, and the whole is mounted upon a flat base, the framework being made up of two stout columns and an upper cross-bar. At the lower part is mounted a small shaft and a crank, so as to carry the spring-barrel *B*. The object of the device is to wind up the spring inside of the barrel by means of the crank, and at the same time to cause the barrel, which as we have seen in connection with the spring, to exert a pull by means of a cord and rod, upon an upper spring which is seen at *H*, and by this means to inscribe curves upon a drum. To this end, the barrel can be readily fitted upon the lefthand end of the shaft, and the righthand end then adapts itself to the square end of the spring shaft so as to be able to wind up the spring just as a watch key would, and the winding is thus carried out by turning the crank. The spring shaft is connected to the barrel only through the spring itself, which thus couples shaft and barrel by a loose and not by a fixed coupling, so that it is evi-

(Concluded on page 497.)

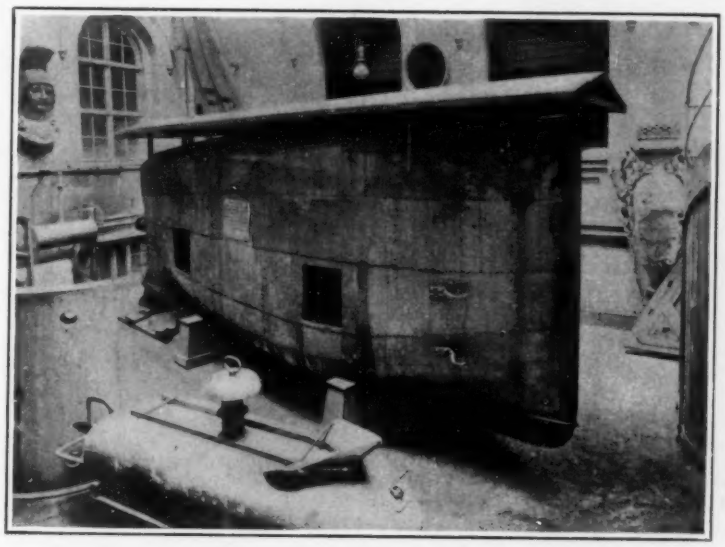
Floral Siamese Twins

THE accompanying photographs represent a specimen of the common black-eyed Susan, in which three flowers, with their stems, appear to have grown together as one. The specimen was found by Leslie Van Raalte of Schenectady, New York. Inquiry at the Department of Agriculture has elicited the following information in regard to this freak:

"It is an example of what botanists call fasciation. The Latin word *fascia* means a broad band, and a fasciation is a stem which has become expanded into a flat ribbon-like form as if several stems had grown together in one plane. Perhaps no plant, unless possibly the dandelion, is oftener found in a fasciated condition than the black-eyed Susan. Seedlings of *Ailanthus*, the Chinese tree of heaven, are frequently found with the main stem expanded into a fan-like fasciation several inches wide.

"Some fasciations are due to mechanical injury, but most plants which show the peculiarity have inherited it, and are in turn able to transmit it to at least part of their descendants. The common red cockscomb of gardens (Celosia) is an example of a plant in which the fasciated condition is more familiar than the normal. It is of course reproduced from seed. Oftentimes the tendency to develop fasciated branches is inherited, but the character does not become manifest for several years, or not until conditions become especially favorable. At least one case has been recorded in which an apparently normal plant of the black-eyed Susan was transplanted to a garden, and thereafter, until it died, developed fasciations and various other abnormalities each year. The corn plant frequently bears fasciated ears. Probably many of your readers have observed such ears of popcorn. Both normal and fasciated ears may be borne on the same plant, and seeds from either a normal or fasciated ear of such a plant may give fasciated ears in the next generation. In fact, there is a cultivated variety of sweet corn known as bear's foot, which normally has fasciated ears."

An example of fasciation. Three black-eyed Susans grown together.



Iron hulled German submarine built in 1850, now on exhibition at the Naval Museum in Berlin.

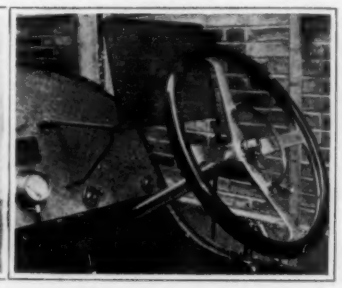
Stepless Omnibuses in New York

FOLLOWING in the wake of the "stepless" trolley cars in use on several street car lines in New York city, the first "stepless" motorbus has made its appearance in America's largest city. The vehicle is electrically driven, and presents a somewhat novel appearance to those familiar with the usual type of motorbuses.

The height of the "platform" above street level is but 12½ inches, or an easy step even for hobble-skirted feet. The vehicle is double-decked, the stairs being inside, toward the rear. It has a seating capacity of eighteen persons inside and twenty on the "hurricane deck." The roof of the omnibus is but 7 feet 8 inches above street level, which insures its safe passage under all elevated railroads and trolley wires. This, in a city like Brooklyn, for instance, is of the greatest importance.

The driver's compartment is glass-inclosed and is reached from the inside of the vehicle. The total length of the omnibus is 20 feet 10 inches. Power is furnished by a hundred-cell Edison storage battery to two 10 horse-power motors, which transmit motion to the rear wheels by means of a universal shaft, without differential. The vehicle can be operated at a speed of 20 miles an hour, if desired.

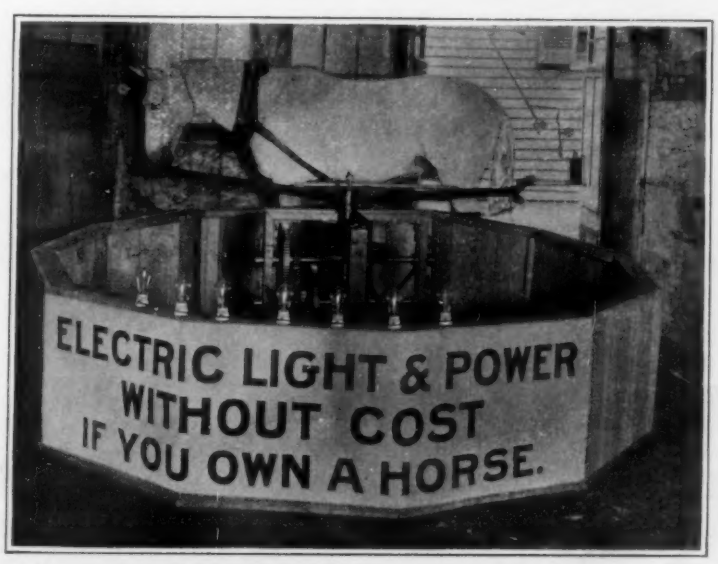
The stepless omnibus in New York.



Individual wire windshield.

An Equine Electric Generator

AN inventive genius in Cincinnati has invented a "one horse-power" electric generator in which the prime mover is a real horse. The apparatus is in the form of a mill, with a 14-foot track, around which the horse has to travel, thus imparting motion to a set of gears connected to a dynamo. To keep the horse moving, he has devised an automatic whip, which may be seen in the accompanying photograph. As long as the horse is moving this whip is inoperative, but as soon as the tension on the traces is relaxed a circuit is closed which energizes a solenoid. This gives a tug upon the core of the solenoid, which is connected by a cord to the butt-end of the whip. The result is a light tap on the back of the horse, which reminds him that he must keep moving. At the same time an electric bell is sounded, which calls the attention of the owner to the fact that the horse has stopped, and if he finds, by hearing the continuous ringing of the bell, that the horse has not obeyed the whip, he can go out to use further methods of persuasion. The electricity generated by this apparatus goes into a storage battery. It is claimed that three hours' work furnishes enough current to light the house for an entire week.



A "one horse-power" electric generator, which furnishes light for a seven-room house.

The First German Submarine

AMONG the historical relics on exhibition in Berlin is the "Plongeur-Marine," Germany's earliest submarine. It was invented by a Bavarian named Wilhelm Bauer. The boat is of iron and dates back to 1850. It was tried at Kiel, but its thin sides were crushed by the pressure of the water, and it remained at the bottom until it was discovered when the first excavations for the Kiel Canal were being made. The old submarine was then raised, and placed in the Naval Museum in Berlin. Old as it is, this submarine is not the first one ever built. References to submarine operations date back to 1372. In 1727 no less than fourteen submarine patents had been issued in England. In 1775 H. M. S. "Eagle" was attacked in New York harbor by a submarine built by David Bushnell. Sergeant Lee, in charge of the submarine, actually got under the ship, but was unsuccessful in attaching the torpedo to the bottom of the vessel. Between 1795 and 1812 Fulton experimented in France and America, and showed that it was possible to build a vessel which could be navigated under water.

Wire Windshields

PICTURED in the accompanying engraving is a small windshield of wire netting mounted on suitable brackets directly in front of the steering wheel of an automobile. It is just large enough to screen the driver of the machine and is of particular value on a high speed car as it offers far less resistance than the ordinary glass windshield which stretches across the entire width of the car body. Being made of wire netting it never bothers the driver with the glare of reflected light. Although porous, the air cannot pass through it with sufficient velocity to produce an objectionable draft. Furthermore, in case of accident the driver need have no fear of splinters.

Ecological Evidence in Court

A NOTE in *School Science and Mathematics* records what is said to be probably "the first recognition of ecological methods in courts of law," the case being one in which Prof. Henry Chandler Cowles of the University of Chicago was engaged by the United States Department of Justice to decide from the nature of the timber and other evidence whether a certain tract of valuable timber land in Arkansas had been a lake at the time the land was surveyed in 1847. Prof. Cowles's investigations proved that the survey which showed this region as a lake was undoubtedly fraudulent. Not only was there no evidence of a beach line, but many immense upland trees were found on the tract, ranging from 200 to 1,000 years old. In the same connection Prof. Cowles also investigated certain other tracts which had been surveyed as lakes, with similar results.

SEVENTEENTH ANNUAL

Motor Number

of the

SCIENTIFIC AMERICAN

January 2, 1915

FOR a complete history of the automobile refer to the files of the Scientific American. The whole story is there from the birth of the motor-driven vehicle, long before the first automobile journal was published, down to the present day. Week by week the biography is written and annually there is a *resumé* of the year's developments. The seventeenth annual *resumé* will be found in the issue of January 2, 1915. The following are some of the subjects that will be taken up:

The Car of 1915. One might suppose that in all these years of development the automobile had reached a point where there would be practically no further growth. However, the new year ushers in some important innovations and a great many lesser improvements, which, slight as they may seem, make for greater comfort and convenience. They will be described fully and illustrated with sketches.

American Auto Coach Work. Foreign car-body builders, instead of following standard patterns, have shown a great deal of originality in the design of car bodies. This is now having its effect on on our own car-body builders who are coming out this year with many artistically modeled vehicle bodies. There will be a discussion of this subject with pointed criticisms of various models both foreign and American. The article will be illustrated with a score of automobile body designs.

How Small Communities May Have Good Roads. Never in the world's history have roads been subjected to such hard usage as in the present day, and never has the subject of road-building received so much scientific investigation. Yet out of two and a quarter million miles of public roads in this country, only a quarter of a million are improved with any form of surfacing. Evidently there is still a great deal of work to be done by rural communities. Logan Waller Page, Director of the Office of Public Roads, gives some valuable suggestions on co-operative undertakings that will make good roads available for small communities.

Military Tactics and the Motor. The absolute necessity of the motor car in modern warfare has been demonstrated in the present titanic struggle in Europe. A very comprehensive article has been prepared on the use of the motor vehicle, in transporting guns, ammunition, supplies and men, and in bearing the wounded to the rear.

The Fuel Problem. The enormous demands upon our supplies of hydrocarbon fuels have made it necessary to develop new methods of obtaining fuels volatile enough to be used in the motor car. The Burton process of producing gasoline has done much to relieve the shortage. Just what this process is will be explained in full.

Purchaser's Guide. As in previous issues of the Annual Motor Number there will be a table of American made cars classified according to price, so that the prospective purchaser may know what he can buy for $500, $1,000, $1,500, etc. There will be a similar list of commercial vehicles classified according to capacity.

In addition to these articles the issue will contain illustrations and brief descriptions of the latest automobile accessories. There will be an oiling chart for the automobile, explaining what parts need attention in the standard chassis and engine. A motorcycle trouble chart will explain where troubles are liable to occur and how they may be overcome or avoided.

A Colored Cover by Gerrit A. Beneker

PRICE 15 CENTS ON ALL NEWSSTANDS

Watch Spring Testing Apparatus

(*Concluded from page 494.*)

dent that when the barrel follows the movement of the spring shaft it will rotate, but the force produced by its rotation depends on the condition of the spring which couples the shaft to the barrel. Were the shaft coupled direct to the barrel the pull exerted by the latter through the cord and on the top spring would be quite uniform, and the pointer which is attached to the cord and strip would move in a straight line. But as the force of the crank and shaft is transmitted to the recording part through the action of the spring, it is evident that the elasticity of the spring enters in as a factor in the amount of pull which the barrel now gives upon the recording part of the apparatus, and should the elasticity be variable, the pull will also be variable.

The barrel is connected to the rod or strip by means of a silk thread, or in the case of stronger springs, such as clock springs, by catgut cord. A guide piece attached to the pillar serves to keep the vertical movement quite straight. In order to secure the records, the cylinder *C*, which carries the ruled paper, is made to rotate at the same time that the shaft is being turned, and it is connected with this shaft through the worm gear, which will be observed. On placing the mounting barrel with its spring, the crank is slowly turned so as to stretch the silk thread, and this serves to set the apparatus for the start. It only remains to loosen the recording drum by means of a set-screw and to adjust it so that the pen will be placed at the zero point on the paper, after which the drum is again affixed to its shaft. The actual test upon the spring now begins by winding it up slowly with the crank, and the variable pull given by the spring is recorded. This is continued until the spring is wound up. By unwinding, a reverse curve can be had, with some difference due to friction. One chart shows a good watch spring which had been in use for six years, and the second chart represents the diagram of the same spring after cleaning. It is remarkably regular at the point between 2½ and 5½ turns of the crank, and can be compared to chart 3, made with an inferior spring. The value of the new apparatus for checking up the quality of watch or chronometer springs is thus evident.

The Work and Needs of the United States Patent Office

(*Concluded from page 491.*)

application filed, which means that each assistant may devote to one applicant ten hours' time. I am fully convinced that it would pay the public in the greater certainty respecting patents, reduced trouble in the courts, and complications in business and the like, if the Government were to appropriate at least twice as much as is now appropriated, without respect to the fees received by the Office. I have never urged the surplus as a reason for larger appropriations. If the work were being adequately done, the fact that there is a surplus might be ground for reducing the fees, or perhaps for increasing salaries paid, but not for enlarging the force. Moreover, an enlargement of the force to the limit of the surplus would not make adequate provisions for proper searches.

But whatever Congress may do, even under the most favorable conditions, it will still remain true that parties contemplating litigation would spend on the average more time and money than can be spent on all applications filed. The courts will always have more light on the particular cases brought into litigation than the Patent Office has on those applications when they go through the Office. The Office will, therefore, always be open to the charge of doing superficial work which of course impairs the respect for it.

Growth of Work in the Patent Office.

Conditions in this respect are growing worse rather than better. The committees of Congress have adopted a sort of a rough rule that they will grant increases only on the basis of increase of number of items of any class to be dealt with. If, for example, one man can handle say

1,000 pieces of mail a day and the number if pieces of mail is doubled, they will grant appropriation for another man. The application of such a rule to the Patent Office is unfortunate for two reasons: first, that the work has always outrun the capacity of the force provided, and therefore increase in the number of examiners in proportion to the number of applications filed leaves the force inadequate; and secondly, that the field of search is widening so that the labor of handling a single application increases with time. For example, in 1884 there were, roughly, 300,000 United States patents. In 1894 there were, roughly, 500,000. In 1904 there were, roughly, 750,000. Now, in 1914, there are over 1,100,000. Proper classification may do much to lighten the labor of searching, but nothing can prevent embarrassing growth in the number of patents which must be searched through against each application. The foreign art which is available is increasing, moreover, in even larger proportions.

Nor is there any hope that the number of applications will diminish, and the Office force thereby becomes adequate for handling the current business. Even in the present disturbed state of the world's business, more applications are being filed this year than last, and since 1884 the number of applications filed per year has grown from about 35,000 to about 70,000.

I believe that this growth will continue. The reason will be plain on a moment's consideration of the nature of the invention. I shall not undertake to give a formal definition of a patentable invention under our law, but it is essentially a new relation of utility in an art, machine, manufacture, or composition of matter. The more arts, machines, manufactures, and compositions of matter that there are, the more relations there are that may be discovered. I have no doubt that in another twenty-five or thirty years the number of applications filed per year will reach 100,000.

If Congress cannot be educated to an understanding of the difficulties which these conditions present, the system of examination will break down of its own weight. I trust that you gentlemen of the Bar may be able to help in this work of education.

The Current Supplement

A MOST interesting article in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT No. 2032, for December 12th, describes a series of ingenious experiments for ascertaining the effect that water pressure has had in determining the form of different classes of fish. Another valuable article is a continuation of the investigations into the acoustics of auditoriums, made at the University of Illinois, and the methods adopted for remedying certain defects. The article by Dr. Dudley on rail sections is completed. Some facts in regard to the sources and supply of Spanish cedar are given, with illustrations. Ideals in city planning contains suggestions in regard to results to be sought, that can be secured by business administration by trained experts. There is also a story about some of the new Government workshops in Washington. Other articles describe an instrument that enables the blind to read by sound; a prismatic astrolabe for determining time and latitude; theories about the Gulf Stream, and identifying different types of electric motors.

Extending the Term in Applications for Design Patents.—In carrying out the practice instituted by Commissioner Ewing, of permitting an applicant for a design patent who specified the term in his application as two and one half years or seven years, to extend such term after the filing of the application on the payment of the additional fee, the Patent Office when a design application for one of the shorter term, is found to be in condition for allowance, addresses a letter to such effect to the applicant or his attorney suggesting that the term may be extended within the maximum period allowed by law together with the balance of fee for the larger term and allowing a certain time specified within which such action may be taken.

To Present and Prospective Users of Motor Trucks:

EFFICIENT truck service—as rendered by The White Company—has two distinct functions: First—*Service at the time of purchase;* Second—*Service following the sale.*

By far the most valuable to the truck owner is the *first* named. The truck buyer will feel secure in his choice when he decides upon the White. He is entitled to the assurance of *selection to fit his needs*—and to enjoy this he must have the counsel and co-operation of engineers and transportation analysts who are not only most highly skilled in putting *built-in service* into trucks, but capable of telling the purchaser what he should have to meet his particular needs.

Complete truck service—White truck service—begins the moment the prospective buyer indicates his willingness to have the economies of motor truck use proved to his satisfaction.

White engineers have not only developed a product which in itself demonstrates that a White truck is the *right* truck, but their service in advance of the sale insures the buyer getting the *right White.*

WHITE Supremacy Is the Result of Double Engineering Efficiency

—an efficiency that is applied with equal fidelity to both tasks. In such service there is protection against buying a truck larger than one needs—or of unsuitable design and equipment—or against buying a truck that is too small for the work it is to do.

The truck for *your* job—fitted to *your* needs—given an individuality that means perfect adaptability to *your* hauling or delivery problems—is the truck The White Company is prepared to make for you.

Great fleets of Whites—owned and daily operated by scores of the largest concerns in America—afford ample proof of White efficiency.

The point we emphasize here and now—at a time when proper attention to the home demand and the home market is so vital a thing—is that the very same efficiency which has made White supreme among the big users of trucks is at the command of the one who requires only three trucks, or two, or one.

This is an invitation to any person—of whose business the hauling or delivering of raw products or finished merchandise is a part—to write to The White Company for complete details regarding prepurchase service.

Your request for information will have the immediate attention of transportation analysts—their reply being based upon the requirements of your own hauling problem.

White trucks are of all sizes—for all uses. They are doing profitable work in cities, in towns, in country, in camp, on milk routes, with fire departments—under every condition and at an endless variety of tasks.

Their leadership in all fields is a daily demonstration of sturdy character, mechanical correctness and high quality.

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